

Rule 21 Working Group Meeting
December 12, 2001

California Energy Commission
1615 9th Street, Hearing Room B
Sacramento, CA

Meeting Agenda
9:30 am – 4:00 pm

Morning Session (9:30 am to 12:30 pm)

- * Introductions
- * Final Revisions to Rule 21

Lunch (12:30 pm to 1:30 pm)

Afternoon Session (1:30 pm to 4:00 pm)

- * Final Revisions to Rule 21
- * Next Meeting and Location?

ATTACHMENT A

Rule 21 Model Tariff Language

[General Comments, by the Compilation Editor]

[1. This Compilation is based on CPUC Decision 00-12-037; the Decision document will be called the "Rule21 Decision" or "Decision" in this Compilation.

2. In the two General Comments below, the utilities are grouped within a single comment; however, in the Rule21 text that follows, all specific comments (or Advice Letter variations) are separated by individual commenter.

3. After each Rule21 paragraph, there will be comments from the 3 Investor-Owned Utilities (IOUs) and from other commenters. If one or two of the utility commenters have no comment, the comment is marked "no change". Following these comments, there is a Resolution section, which is left blank until the group forms a resolution on an issue. When two commenters have an identical (word-for-word) comment, they are grouped together.

4. Section numbering throughout the document, both in the sections and in textual references, both in the comments and in the original Decision text, has been changed to conform to the A.1.a.1 style of numbering used by the IOUs. Those changes are not highlighted in the comments, even though they constitute changes (additions and strike-outs) from the original Decision text.]

[Both PG&E and SCE

a) refer to the California Public Utilities Commission as the "Commission" (not as CPUC);

{Consensus: Yes. Status: Done}

b) refer to Tariffs as "tariff schedules"; {Consensus: Yes. Status: no search yet performed}

c) refer to the Interconnection Agreement as the "Agreement" or as the "Generating Facility Interconnection Agreement"; {Consensus: Yes on "Agreement", no on GFIA. Status: Done}

d) refer to the Electricity Producer as the "Producer"; {Consensus: Yes. Status: Done}

e) refer to the Application as the "Generating Facility Application"; {Consensus: No. Status: Done}

g) refer to an Island or Islanding as a "Distribution System Island" (see Glossary) ;

h) refer to "the Distribution System" as "[EC]'s Distribution System", where [EC] is replaced by the utility initials;

i) replace the period after subsection titles with a semi-colon.

These differences should be assumed in the text that follows. To avoid cluttering the text, these differences have not been marked in the comment text except when necessary to highlight another change in the text occurring just before or after one or more of the differences a-i above.

PG&E and SCE also refer to a Distributed Generator, Generator, and DG "Generating Facility" or as a "Generating Unit", depending strictly on whether what is being described is the whole facility or a single electricity generating machine, respectively. Because the change constitutes in some cases a clarification of the Decision text, these changes are marked in the document. It should be noted that the group formed consensus to discontinue use of "DG" and "Distributed Generator" and not to introduce a new definition for "Generating Unit"; the term to be applied in all these cases is the term (already defined) "Generator", which refers to a single individual electricity generating machine.]

A. APPLICABILITY

Applicability. This Rule describes the interconnection, operating and metering requirements for Generating Facilities to be connected to the Distribution System over which the California Public Utilities Commission (Commission) has jurisdiction. Subject to the requirements of this Rule, Electrical Corporation will allow the interconnection of Generating Facilities with its Distribution System.

Definitions. Capitalized terms used in this Rule, and not otherwise defined, shall have the meaning ascribed to such terms in Section H. The definitions in this Rule shall only apply to this Rule and may not apply to EC's other Tariff Schedules.

B. GENERAL RULES, RIGHTS AND OBLIGATIONS

- 1. Authorization Required to Operate.** A Producer must comply with this Rule, execute an Interconnection Agreement with Electrical Corporation, and receive Electrical Corporation's express written permission to operate a Generating Facility in parallel with the Distribution System. Electrical Corporation shall apply this Rule in a non-discriminatory manner and shall not unreasonably withhold its permission to interconnect an Electric Producer's Generating Facility.
- 2. Separate Arrangements Required for Other Services.** A Producer requiring other electric services from the Electrical Corporation including, but not limited to, Distribution Service provided by the Electrical Corporation during periods of curtailment or interruption of a Generating Facility, must enter into separate arrangements with Electrical Corporation for such services in accordance with Commission-approved Tariff Schedules.
- 3. Transmission Service Not Provided with Interconnection.** Interconnection with the Electrical Corporation's Distribution System under this Rule does not provide a Producer any rights to utilize Electrical Corporation's Distribution System for the transmission or distribution or wheeling of electric power, nor does it limit those rights.
- 4. Compliance with Laws, Rules, and Tariffs.** A Producer shall ascertain and comply with applicable Commission-approved rules, Tariff Schedules, and regulations of Electrical Corporation; applicable Federal Energy Regulatory Commission-approved rules, tariffs, and regulations; and any local, state or federal law, statute or regulation which applies to the design, siting, construction, installation, operation, or any other aspect of the Producer's Generating Facility and Interconnection Facilities.
- 5. Design Reviews and Inspections.** Electrical Corporation shall have the right to review the design of a Producer's Generating Facility and Interconnection Facilities and to inspect a Producer's Generating and/or Interconnection Facilities prior to the commencement of Parallel Operation with Electrical Corporation's Distribution System. Electrical Corporation may require a Producer to make modifications as necessary to comply with the requirements of this Rule. Electrical Corporation's review and authorization for Parallel Operation shall not be construed as confirming or endorsing the Producer's design or as warranting the Generating and/or Interconnection Facilities' safety,

durability or reliability. Electrical Corporation shall not, by reason of such review or lack of review, be responsible for the strength, adequacy, or capacity of such equipment.

6. **Right to Access.** A Producer's Generating Facility and Interconnection Facilities shall be reasonably accessible to Electrical Corporation personnel as necessary for Electrical Corporation to perform its duties and exercise its rights under its tariffs and rules approved by the Commission, and any Interconnection Agreement between Electrical Corporation and the Producer.
7. **Confidentiality of Information.** Any information pertaining to Generating and/or Interconnection Facilities provided to Electrical Corporation by a Producer shall be treated by Electrical Corporation in a confidential manner. Electrical Corporation shall not use information contained in the Application to propose discounted tariffs to the customer unless authorized to do so by the customer or the information is provided to Electrical Corporation by the customer through other means.
8. **Prudent Operation and Maintenance Required.** A Producer shall operate and maintain its Generating Facility and Interconnection Facilities in accordance with Prudent Electrical Practices and shall maintain compliance with Commission adopted standards for the Producer's particular Generation and Interconnection Facilities. Said standards shall be those in effect at the time a Producer executes an Interconnection Agreement with Electrical Corporation.
9. **Curtailment or Disconnection.** Electrical Corporation may limit the operation or disconnect or require the disconnection of a Producer's Generating Facility from Electrical Corporation's Distribution System at any time, with or without notice, in the event of an Emergency, or to correct Unsafe Operating Conditions. However, the Electrical Corporation must provide written notice as soon as possible following such disconnect. Electrical Corporation may also limit the operation or disconnect or require the disconnection of a Producer's Generating Facility from Electrical Corporation's Distribution System upon the provision of reasonable written notice: 1) to allow for routine maintenance, repairs or modifications to Electrical Corporation's Distribution System; 2) upon Electrical Corporation's determination that a Producer's Generating Facility is not in compliance with this Rule; or, 3) upon termination of the Interconnection Agreement. Upon the Producer's written request EC shall provide a written explanation of the reason for such curtailment or disconnection.

C. APPLICATION AND INTERCONNECTION PROCESS

1. Application Process

- a. Applicant Initiates Contact with the Electrical Corporation.** Upon request, Electrical Corporation will provide information and documents (such as sample agreements, the Application, technical information, listing of Certified Equipment, application fee information, applicable rate schedules and metering requirements) in response to a potential Applicant's inquiry. Unless otherwise agreed upon, all such information shall normally be sent to an Applicant within three (3) business days following the initial request from the Applicant. Electrical Corporation will establish an individual representative as the single point of contact for an Applicant, but may allocate responsibilities among its staff to best coordinate the Interconnection of an Applicant's Generating Facility.
- b. Applicant Completes and Files an Application.** All Applicants shall be required to complete and file an Application and supply any additional information requested by the Electrical Corporation. The filing must include the completed Application and a fee for processing the application and performing the Initial Review to be completed by the Electrical Corporation pursuant to Section C.1.c. The application fee shall vary with the nature of the proposed Generating Facility as follows:

Type of Service	Initial Review	Supplemental Review
Net Energy Metering <i>(per Public Utilities Code Section 2827)</i>	None	None
All others	\$800	\$600 (additional)

Note: Allocation of cost between DG Applicant and Electrical Corporation to be determined by Commission in Phase 2 of R.99-10-025. The total cost borne by the Applicant should be reduced by the cost allocated to the utility's distribution function.

Fifty percent of the fees associated with the Initial Review will be returned to the Applicant if the application is rejected by Electrical Corporation or the Applicant retracts the application.

The Applicant may propose and the Electrical Corporation may negotiate specific costs for processing non-standard installations such as multi-units, multi-sites, or otherwise as conditions warrant. The costs for the Initial Review and the Supplemental Review contained in this Section, as well as the language provided in Sections C.1.c and C.1.d do not apply under these circumstances.

Within ten (10) business days of receiving an Application, Electrical Corporation shall normally acknowledge its receipt and state whether the Application has been completed adequately. If ~~defects~~ deficiencies are noted, Electrical Corporation and Applicant shall cooperate in a timely manner to establish a satisfactory Application.

~~[[Editor: Edits 11-29-2001 stop here]]~~

c. Electrical Corporation Performs an Initial Review and Develops Preliminary Cost Estimates and Interconnection Requirements.

- (1) Upon receipt of a satisfactorily completed Application and any additional information necessary to evaluate the Interconnection of a Generating Facility, Electrical Corporation shall perform an Initial Review using the process defined in Section I. The Initial Review determines if (a) the Generating Facility Application qualifies for Simplified Interconnection, (b) ~~if the~~ Generating Facility Application can qualify for Interconnection subject to additional requirements, or (c) ~~if~~ it will be necessary for Electrical Corporation to perform an Interconnection Study to determine the Interconnection Requirements.

[C.1.c.1 SCE / PG&E: "...Review determines if (a) the Generating Facility Application qualifies for Simplified Interconnection, (b) the Application Generating Facility can qualify for Interconnection subject to minimal additional requirements or ~~if~~ (c) ... to determine the Interconnection Requirements."]

[C.1.c.1 SDG&E: no change]

[C.1.c.1 Resolution: SCE, except delete "minimal"]

- (2) The Electrical Corporation shall complete its Initial Review, absent any extraordinary circumstances, within 10 business days, upon determination that the Application is complete, ~~if the~~ Application Generating Facility qualifies for Simplified Interconnection. If the Initial Review determines that the proposed facility can be interconnected by means of a Simplified Interconnection, the Electrical Corporation will provide the Applicant with a written

description of the requirements for interconnection and a draft
Interconnection Agreement pursuant to Section C.1.e.

[C.1.c.2 PG&E: "...for interconnection and ~~a draft interconnection the~~ Agreement Pursuant to..."]

[C.1.c.2 SCE: "...business days if the ~~Agreement Application~~ qualifies for Simplified..."

"...for interconnection and ~~a draft interconnection the~~ Agreement Pursuant to..."]

[C.1.c.2 SDG&E: no change]

[Werner Blumer, CPUC, 02162001: "By means of a Simplified Interconnection" again seems to denote a fixed design. What are the written "Requirements for interconnection", other than these rules? Why is the Interconnection agreement a "draft"? (executable version?).]

[C.1.c.2 Resolution: SCE with change]

- (3) If the Application-Generating Facility does not qualify for Simplified Interconnection as ~~proposed~~submitted, the Electrical Corporation will notify the Applicant and perform Initial Review ~~will include~~ a Supplemental Review as described in Section I. The Supplemental Review will ~~provides~~ either (a) Interconnection Requirements ~~that may include requirements~~ beyond those for Simple Interconnection, and a draft Interconnection Agreement, or (b) a cost estimate and schedule for an Interconnection Study. The ~~s~~Supplemental ~~r~~Review shall be completed, absent any extraordinary circumstances, within 20 business days upon determination that the Application is complete. ~~of receipt of a completed Application~~. Payment for the Supplemental Review shall be submitted to the Electrical Corporation within 10 calendar days after the results of the Supplemental Review are provided to the Applicant.

[C.1.c.3 PG&E: "The Supplemental Review will provide ~~provides~~ either (a) Interconnection Requirements that

may include requirements beyond ..."

"Simple Interconnection, and an ~~a draft Interconnection~~ Agreement, or (b)..."]

[C.1.c.3 SCE: "...If the Generating Facility Application does not qualify..."

"The Supplemental Review will provide ~~provides~~ either (a) Interconnection Requirements that may include requirements beyond ..."

"Simple Interconnection, and an ~~a draft Interconnection~~ Agreement, or (b)..."]

[C.1.c.3 SDG&E: no change]

[Werner Blumer, CPUC, 07092001: C.1.c.3 Clarify first sentence: "If the Generating Facility...for Interconnection as proposed, a Supplemental Review will be performed as described in Section I, after notifying the applicant of the additional fee."

Second sentence: Delete "...that may include requirements ..." and clarify "...Additional Interconnection Study", delete "beyond those for Simple Interconnection".

Why is the agreement a draft, not an executable version (as in C.1.e)?

Are the 20 days really counted from receipt of the application or additionally?]

[C.1.c.3 Chuck Whitaker, 09142001: I think it's important that one result of the Supplemental Review might still be Simplified Interconnection. There may be other places where similar changes are necessary, and the utilities may have some objections to my rewording but I thought I would offer them anyway. My comments are almost directly opposed to the PG&E/SCE change, which says that the Supplemental review SHALL result in additional requirements. This also suggests that in the IRP, for each step where it says, for example:

If Yes, the Generating Facility does not qualify for Simplified Interconnection. Perform supplemental review should be changed to:

If Yes, the Generating Facility MAY not qualify for Simplified Interconnection. Perform supplemental review;

Or:

If Yes, the Generating Facility does not AUTOMATICALLY qualify for Simplified Interconnection. Perform supplemental review.]

[Editor: The SCE & PG&E versions both maintain the phrase "The Supplemental Review will provide Interconnection Requirements that *may include* requirements beyond those for Simple Interconnection..." (my italics)...]

[C.1.c.3 Resolution:]

d. When Required, Applicant and Electrical Corporation Commit to Additional Interconnection Study Steps. When an Initial Review reveals that the proposed facility cannot be interconnected to the Electrical Corporation's Distribution system-System by means of a Simplified Interconnection ~~pursuant to Section 4 and Section J, and or~~ that significant Electrical Corporation Interconnection Facilities or Distribution System ~~i~~improvements must be installed or made to ~~the~~ Electrical Corporation's ~~electric system~~ Distribution System to accommodate the interconnection of an Applicant's Generating Facility, the Electrical Corporation and Applicant shall enter into an agreement that provides for ~~the~~ Electrical Corporation to perform ~~such~~ additional studies, facility design, and engineering and to provide detailed cost estimates for fixed price or actual cost billing, to the Applicant at the Applicant's expense. The ~~i~~interconnection ~~s~~study ~~A~~agreement shall set forth ~~the~~ Electrical Corporation's schedule for completing such work and the estimated or fixed price costs of such studies and engineering. Upon completion of an Interconnection Study, ~~the~~ Electrical Corporation shall provide the Applicant with the specific requirements, costs and schedule for interconnecting the Generating Facility to accommodate execution of agreements pursuant to Section C.1.e.

[C.1.d PG&E: "...Simplified Interconnection pursuant to ~~Section 4 and Appendix B, the Rule, Sections D and J. (Testing and Certification Criteria)~~ and that significant...to the Electrical Corporation's ~~electric system~~ PG&E's Distribution System to accommodate..."]

[C.1.d SCE: "...Simplified Interconnection ~~pursuant to Section 4 and Appendix B, and that significant...or Distribution System Improvements improvements...~~ to ~~the Electrical Corporation's electric system~~ PG&E's Distribution System to accommodate...to perform ~~such~~ additional studies...The Interconnection Study Agreement-interconnection study agreement shall set..."]

[C.1.d SDG&E: no change]

[Werner Blumer, CPUC, 05142001: What are the "significant EC Interconnection Facilities" other than the "Distribution System Improvements"?]

[Werner Blumer, CPUC, 07092001: C.1.d First sentence: Since the proposed design already went through the additional review, it should read "...cannot be interconnected to EC's distribution system with minimal additional requirements, pursuant ..."]

Last three sentences are not clear as to what the costs referred to include and are duplicative. One agreement should include the cost for the study to establish the requirements, another for the engineering, provision and construction of the distribution system improvement (isn't anything before the meter "distribution system improvement", including "interconnection facilities"?). A third party could perform the engineering, provision and construction of the improvements (see E.3.c), so the agreements have to be separate. C.1.e Seems not to allow for this.]

[C.1.d Resolution:]

- e. Applicant and Electrical Corporation Enter Into a Generation Interconnection Agreement and, Where Required, a Financing and Ownership Agreement for Interconnection Facilities or Electric System Modifications.** The Electrical Corporation shall provide the Applicant with an executable version of the Interconnection Agreement, Net Energy Metering Agreement, or Power Purchase Agreement appropriate for the Applicant's Generating Facility and desired mode of operation. Where the Initial Review or Interconnection Study performed by the Electrical Corporation has determined that modifications or additions are required to be made to its Electric System, or that additional metering, monitoring, or protection devices will be necessary to accommodate a Applicant's Generating Facility, the Electrical Corporation shall also provide the Applicant with an Interconnection Facilities Financing and Ownership Agreement (IFFOA). The IFFOA shall set forth the respective parties' responsibilities, completion schedules, and estimated or fixed price costs for the required work.

[C.1.e SCE / PG&E: No caps on "net energy metering agreement" and "power purchase agreement"; "Enter Into a Generation Generating Facility Interconnection...executable version of the Generating Facility Interconnection Agreement...Facilities or Electric Distribution System Modifications...be made to its Electric Distribution System, or that additional...version of the Generating Facility Interconnection Agreement, [start no caps] net energy metering agreement, or power purchase agreement [end no caps] appropriate...made to its Electric electric Distribution System...to accommodate an Applicant's ... the [EC] shall may also provide the Applicant with an other Interconnection Facilities...[start no caps] interconnection facilities financing and ownership agreement [end no caps] (IFFOA) as necessary. The IFFOA These agreements shall set forth the respective parties' Applicant's responsibilities..."]

[C.1.e SDG&E: no change]

[C.1.e Resolution: SCE]

- f. ~~Producer Installs or Constructs the Generating Facility; Where Applicable, Electrical Corporation or Producer Installs Required Interconnection Facilities or Modifies Electrical Corporation's Electric Distribution System.~~** After executing the appropriate applicable agreements ~~Generation Interconnection or Power Purchase Agreement, and where required, the IFFOA, the Producer may install or construct its Generating Facility in accordance with the provisions of this rule and the terms of the specific agreements formed between the Producer and the~~

~~Electrical Corporation. Where appropriate, the Electrical Corporation or~~
~~Producer~~ will commence construction/installation of the ~~system~~
modifications ~~and/or~~ metering and monitoring requirements identified in
the ~~IFFOA agreements~~. The parties will use good faith efforts to meet the
schedules and ~~fixed costs or estimates, d costs in the IFFOA.~~

[C.1.f SCE / PG&E: " ~~Electricity~~ Producer Installs or Constructs the Generating Facility;... or
~~Electricity~~ Producer Installs Required Interconnection Facilities or Modifies [EC]'s ~~Electric Distribution~~
System. After executing the appropriate ~~Generation Generating Facility~~ Interconnection ~~or Power~~
~~Purchase~~ Agreement, ~~and where required, the IFFOA~~, the ~~Electricity~~ Producer may
install...provisions of this ~~rule Rule~~ and...monitoring requirements ~~identified in the IFFOA which have~~
~~been identified~~. The parties will...or estimated costs ~~in the IFFOA as appropriate.~~"]
[C.1.f SDG&E: no change]

[Werner Blumer, CPUC, 05142001: C.1.f This section should be revised to delete the
requirement that the agreements have to be signed before an EP can install or construct a
Generating Facility, as long as he takes the risk for not obtaining approval to operate it in parallel
with the EC's distribution system for any duration.]

[C.1.f Resolution: see language above]

g. Producer Arranges for and Completes Commissioning Testing of
Generating Facility and, Where Applicable, Producer Installed
Interconnection Facilities. The Producer is responsible for te-sting Nnew
Generating Facilities and associated Interconnection Facilities, according
to Section J.5 must be tested to ensure compliance with the safety and
reliability provisions of the Commission-approved rules and regulations
prior to being operated in parallel with ~~the~~ Electrical Corporation's ~~electric~~
~~system~~ Distribution System. ~~Certified Equipment will be subject to the~~
~~tests specified in Section D. For non-Certified Equipment, the Producer~~
~~will develop a written testing plan to be submitted to the Electrical~~
~~Corporation for its review and acceptance. Alternatively, the Producer~~
~~and Electrical Corporation may agree to have the Electrical Corporation~~
~~conduct the required testing at the Producer's expense. Where applicable,~~
~~the test plan shall include the installation test procedure(s) published by~~
~~the manufacturer(s) of the generation or interconnection equipment.~~
~~Facility testing shall be conducted at a mutually agreeable time, and~~
~~depending on who conducts the tests, the Electrical Corporation or~~
~~Producer shall be given the opportunity to witness the tests.~~

[C.1.g SCE / PG&E: "...in parallel with [EC]'s ~~electric-system~~ Distribution System. ...]

[C.1.g SDG&E: no change]

[Werner Blumer, CPUC, 02162001: Specific sections to App. B (not Section 4) must be shown,
because App. B also lists certification testing requirements.]

[Werner Blumer, CPUC, 07092001: C.1.g It is not clear if the extra costs for reviewing the test
procedures for non-certified facilities and testing of them are included in the additional or in a
negotiated fee. This should be spelled out in C.1.d through C.1.f.] ok as amended above
[12122001--Chuck is adding something under J.5 "written" + "at at mutually agreeable time"-- get note

- h. Electrical Corporation Authorizes Parallel Operation or Momentary Parallel Operation Interconnection.** The Producer's Generating Facility shall be allowed to commence ~~p~~Parallel Operation or Momentary Parallel operation, as applicable, with ~~the~~ Electrical Corporation's ~~electric system~~ Distribution System upon satisfactory compliance with the terms of all applicable agreements~~the Generation Interconnection Agreement, Power Purchase Agreement or Net Energy Metering Agreement and express written permission~~. Compliance may include, but not be limited to, provision of any required documentation and satisfactorily completing any required inspections or tests as described herein or in the agreements formed between the Producer and ~~the~~ Electrical Corporation. A Producer shall not ~~i~~Interconnect a Generating Facility unless it has received ~~the~~ Electrical Corporation's express written permission to do so.

[C.1.h PG&E: "...with ~~the~~ [EC]'s ~~electric system~~ Distribution System...terms of the Generation Generating Facility Interconnection Agreement. ~~, Power Purchase Agreement or Net Energy Metering Agreement~~. Compliance may include... An ~~Electricity~~ Producer shall..."]

[C.1.h SCE: "...with ~~the~~ [EC]'s ~~electric system~~ Distribution System...terms of the Generation Generating Facility Interconnection Agreement, ~~Power Purchase Agreement or Net Energy Metering Agreement and any other applicable agreements as described in Section C.1.f~~. Compliance may include... An ~~Electricity~~ Producer shall..."]

[Werner Blumer, CPUC, 02162001: Since the utilities say in their Rule 21 that other application forms have to be used for Net Energy metering and Power Purchase Agreements, this section should clarify that rule 21 still applies otherwise and maybe those forms should be part of this rule.]

[Editor, 20011204: The term "Generation Interconnection Agreement" should be changed to "Interconnection Agreement"; the term "Net Energy Metering Agreement" should be changed to "Net Energy Metering" and "Interconnection Agreement" (two defined terms side-by-side; and "Power Purchase Agreement" should be left as is.]

[C.1.h SDG&E: no change]

[C.1.h Resolution: okay as above]

- i. Electrical Corporation Reconciles Costs and Payments.** If the Producer selected a fixed price ~~cost~~billing for the Interconnection Facilities or ~~Electric~~Distribution System ~~M~~modifications, no reconciliation will be necessary. If the Producer selected actual cost billing, a true-up will be required. ~~Within a reasonable time after the interconnection of a Producer's Generating Facility, the~~ Electrical Corporation will reconcile its actual costs related to the Producer's facility against any advance payments made by the Producer for interconnection facilities or Distribution System modifications~~the application fee and any other advance payments made by the Producer~~. The Producer will receive either a bill for any balance due or a reimbursement for overpayment as determined by ~~the~~ Electrical Corporation's reconciliation. The Producer shall be entitled to a reasonably detailed and understandable report detailing ~~the~~ Electrical Corporation's reconciliation process.

[C.1.i PG&E: "...cost for the Interconnection Facilities or Electric Distribution System Modifications, no reconciliation will be...facility against the generating facility application fee and..."]

[C.1.i SCE: "...selected a fixed price ~~cost~~ billing for the Interconnection Facilities or Electric Distribution System Modifications, no reconciliation will be...facility against the generating facility application fee and ..."]

[C.1.i SDG&E: no change]

[Werner Blumer, Commission, 07092001: C.1.i It is not clear why the application fee would be offset against the engineering, provision and construction of interconnection and system improvements. The application (\$800) and additional (\$600) fees are fixed and not subject to offset. Not even the negotiated supplemental interconnection study cost seems appropriate for offset against the hardware engineering, provision and installation cost. (Maybe a distinction between interconnection study and hardware engineering is in order.)]

[C.1.i Resolution:]

D. GENERATING FACILITY DESIGN AND OPERATING REQUIREMENTS

[Werner Blumer, CPUC, 02162001: Title says "Operating" but text does not contain it.]

[D. Resolution:]

1. ~~1.~~ General Interconnection and ~~p~~Protection ~~r~~Requirements

a. ~~Momentary Paralleling Facilities Excluded. Section D.1 of this Rule is not intended to address the requirements for Generating Facilities that operate in Momentary Parallel with Electrical Corporation's Distribution System.~~

[D.1.j SCE / PG&E: "~~Momentarily Paralleling Facilities Excluded. Section D of this Rule This section is not intended to address the requirements for ~~generators~~ Generating Facilities that parallel momentarily (60 cycles or less) or ~~generators~~ Generating Facilities that operate independently of the Electrical Corporation—[EC]'s-Distribution System.~~"]

[D.1.j SDG&E: no change]

[Werner Blumer, CPUC, 05142001: D.1.j The requirement for inspection of a break before make disconnect switch prior to operation of an isolated Generating Facility on an account with standby service should be considered.]

[Werner Blumer, CPUC, 07092001: D.1.j This section should go to the beginning of D.1 and the requirements for momentary parallel (<60 cycles) and isolated operation described somewhere.]

[D.1.j Resolution: moving from j(i) to a – changes ok as above]

[Werner Blumer, CPUC, 02162001: Title says "General" but there is "Prevention of Interference" as D.2 subtitle title, not "Specifics".]

ab. ~~Protective Functions Required. The Protective Functions must include an over/under voltage trip function, an over/under frequency trip function, and a means for disconnecting the Generating Facility from Electrical Corporation Distribution System when a protective function initiates a trip. Protective Functions shall be equipped with automatic means to prevent the Generating Facility from re-energizing a de-energized Distribution System circuit.~~

[D.1.a SCE / PG&E: "...and ~~protection requirements~~ Protection Requirements...Automatic Lockout Required: The Protective Functions shall ~~be equipped with~~ include an automatic means to..."]

[D.1.a SDG&E: no change]

[D.1.a Resolution: ok, as above – a & b were switched]

- cb. Automatic Lockout Required. The Protective Functions shall include an automatic means to prevent the Generating Facility from re-energizing a de-energized Distribution System circuit. ~~The Protective Functions of a Generating Facility must include an over/under voltage trip function, an over/under frequency trip function, and a means for disconnecting the DG from the EC when a protective function initiates a trip.~~

[D.1.b PG&E / SCE: "Protective Functions Required: The Protective Functions of...means for disconnecting the DG Generating Facility from [EC]'s Distribution System when ever a protective function..."]

[D.1.b SDG&E: no change]

[Werner Blumer, CPUC, 05142001: D.1.b Should read:" disconnecting from EC's distribution system..."]

[D.1.b Resolution: ok as above a & b were switched]

- de. No Unintended Islanding. The Generating Facility and associated Protective Functions shall not contribute to the formation of an Unintended Island.

[D.1.c PG&E / SCE: "No Unintended Islanding: The Generating Facility..."]

[D.1.c SDG&E: no change]

[D.1.c Resolution: ok]

- ed. Drawings Required. The Producer's protection and control diagrams for the interconnection shall be approved by the Electrical Corporation prior to Parallel Operation or Momentary Parallel operation completion of the Generating Facility Interconnection, unless the Producer uses a protection and control scheme previously approved by ~~the~~ Electrical Corporation for system-wide application or uses only Certified Equipment.

[D.1.d SCE / PG&E: "Drawings Required: The Electricity Procucer's..."]

[D.1.d SDG&E: no change]

[Werner Blumer, CPUC, 05142001: D.1.d Should read:" The Generating Facility's protection ...prior to any length of parallel operation with the EC's distribution system ..."]

[D.1.d Resolution: ok, with W's change]

- fe. Required Delay on Reconnection. Protective Functions shall include be equipped with automatic means to prevent reconnection of the Generating Facility with the Distribution System unless the Distribution System service voltage and frequency is of specified settings and is stable for at least 60 seconds.

[D.1.e PG&E / SCE: "Required Delay on Reconnection: Protective Functions shall...stable for at least 60 seconds."]

[D.1.e SDG&E: no change]

[D.1.e Resolution:]

- ~~f. ——— Certified Equipment contains certified functions that are accepted by all California Electrical Corporations. This equipment may be installed on a~~

~~Distribution System in accordance with an Interconnection control and protection scheme approved by the Electrical Corporation.~~

[D.1.f SCE / PG&E: "~~Certified Equipment~~: Certified Equipment contains...by all California Electrical Corporations Corporations. Certified Equipment ~~This equipment~~ may be installed..."]

[D.1.f SDG&E: no change]

[Werner Blumer, CPUC, 02162001: Acceptance by ALL California ECs may not be true. Why state this? If the equipment is certified, what "control and protection scheme approved" by the EC is there additionally required?]

[D.1.f Resolution: delete]

[Check all references to renumbered Sections.]

- gg. Purpose of Protective Functions. ~~These~~ The Protective Functions and requirements of this Rule are designed to protect the Electrical Corporation's Distribution System and not the Generating Facility. A Producer shall be solely responsible for providing adequate protection for the Producer's Generating Facility and Interconnection Facilities connected to the Electrical Corporation's Distribution System. The Producer's protective equipment shall not impact the operation of other protective devices utilized on the Distribution System in a manner that would affect the Electrical Corporation's capability of providing reliable service to its Customers.

[D.1.g SCE / PG&E: "~~These Purpose of Protective Functions: The Protective Functions and~~ requirements of this Rule are designed to protect...service to its Customers."]

[D.1.g SDG&E: no change]

[D.1.g Resolution: ok as above]

- hh. Suitable Equipment Required. Circuit breakers or other interrupting devices located at the Point of Common Coupling must be Certified or "Listed" (as defined in Article 100, the Definitions Section of the National Electrical Code) as suitable for ~~the~~ their intended application. This includes being capable of interrupting the maximum available fault current expected at their location. The Generating Facility shall be designed so that the failure of any one device shall not potentially compromise the safety and reliability of ~~the~~ Electrical Corporation's Distribution System.

[D.1.h PG&E / SCE: "Suitable Equipment Required: Circuit breakers or other interrupting devices located at the ... as suitable for their intended ~~the~~ application. This includes being capable of interrupting the maximum available fault current expected at their location. The Generating Facility...reliability of ~~the~~ [EC]'s Distribution System."]

[D.1.h SDG&E: no change]

[D.1.h Resolution:]

- ii. Visible Disconnect Required. The Producer ~~will~~ shall furnish and install a manual disconnect device that has a ~~visual break~~ Visible Disconnect to isolate the Generating Facility from ~~the~~ Electrical Corporation's Distribution System. The device must be accessible to Electrical

Corporation personnel and be capable of being locked in the open position. Generating Facilities with ~~n~~Non-iIslanding inverters totaling one (1) kVA or less are exempt from this provision.

[D.1.i SCE / PG&E: "Visible Disconnect Required. The Electricity Producer ~~shall~~ will furnish and install a manual disconnect device that has a visible ~~visual~~ break to isolate the...from ~~the~~ [EC]'s Distribution System. ... Facilities with [add caps] Non-Islanding [end add caps] inverters totaling ~~4kVA~~ one (1) kVA or less..."]

[D.1.i SDG&E: no change]

[Werner Blumer, CPUC, 05142001: D.1.i Should it read:" ...accessible to EC personnel at any time with any necessary keys provided and ..."?]

[ed: Eden will supply a definition for Visible Disconnect.]

[ed: later discussion on what constitutes "accessible"]

[D.1.i Resolution:]

~~j. — This section is not intended to address the requirements for generators that parallel momentarily or generators that operate independently of the Electrical Corporation.~~

~~[D.1.j SCE / PG&E: "Momentarily Paralleling Facilities Excluded. Section D of this Rule This section is not intended to address the requirements for generators Generating Facilities that parallel momentarily (60 cycles or less) or generators Generating Facilities that operate independently of the Electrical Corporation [EC]'s Distribution System."]~~

~~[D.1.j SDG&E: no change]~~

~~[Werner Blumer, CPUC, 05142001: D.1.j The requirement for inspection of a break before make disconnect switch prior to operation of an isolated Generating Facility on an account with standby service should be considered.]~~

~~[Werner Blumer, CPUC, 07092001: D.1.j This section should go to the beginning of D.1 and the requirements for momentary parallel (<60 cycles) and isolated operation described somewhere.]~~

~~[D.1.j Resolution:]~~

2. 2.— Prevention of interference.

The Producer shall not operate equipment that superimposes upon ~~the~~Electrical Corporation's Distribution System a voltage or current that interferes with Electrical Corporation operations, service to Electrical Corporation customers, or Electrical Corporation communication facilities. If such interference occurs, the Producer must diligently pursue and take corrective action at its own expense after being given notice and reasonable time to do so by ~~the~~ Electrical Corporation. If the Producer does not take timely corrective action, or continues to operate the equipment causing interference without restriction or limit, ~~the~~ Electrical Corporation may, without liability, disconnect the Producer's equipment from the Distribution System, in accordance with Section B.9 of this ~~r~~Rule.

To eliminate undesirable interference caused by operation of the Generating Facility, each ~~Distributed Generator~~Generating Facility in a Generating Facility shall meet the following criteria:

[D.2 SCE / PG&E: "...superimposes upon ~~the [EC]'s~~ Distribution...that interferes with [EC] operations, service to [EC] customers, or [EC] communication ... so by [EC]. ... or limit, ~~the [EC]~~ may, without... from ~~the [EC]~~ Distribution ... caused by ~~the~~ operation of the Generating Facility, each Generating Unit Distributed Generator in a Generating Facility..."]

[D.2 SDG&E: no change]

[D.2 Resolution:]

a. **Normal voltage operating range.** The voltage operating range for ~~Distributed~~ Generators shall be selected as a protection function that responds to abnormal Distribution System conditions and not as a voltage regulation function.

(1) ~~Small systems Generating Facilities (11 kVA or less). Distributed Generator systems of Generating Facilities with a Gross Nameplate Rating~~ 11 kVA ~~capacity~~ or less shall be capable of operating within the limits normally experienced on the Distribution System. The operating window shall be selected in a manner that minimizes nuisance tripping and range between 106 volts and 132 volts (88-110% of nominal voltage) on a 120-volt base. Generating Facilities shall cease to energize the Electrical Corporation ~~lines-circuit~~ whenever the voltage at the Point of Common Coupling deviates from the allowable voltage operating range.

[D.2.a.1 PG&E / SCE: "Normal voltage operating range-; ...range for ~~Distributed Generators a Generating Unit~~ shall... Small systems (11 kVA or less)-; ~~Distributed Generator systems-Generating Units connected to a Generating Facility with a Gross Nameplate capacity~~-of 11 kVA ~~capacity~~ or less shall be capable of operating...on ~~the [EC]~~ Distribution ... to energize the Electrical Corporation [EC] lines whenever the voltage at the ~~PCC-Point of Common Coupling~~ deviates ..."]

[D.2.a.1 SDG&E: no change]

[Werner Blumer, CPUC, 05142001: D.2.b.1 Should it read: "...operating range..." ?]

[editor, 07312001: Werner's comment reference should be to section D.2.a.1]

[Werner Blumer, CPUC, 07092001: D.2.a.1 & D.2.a.2 Should say "Generating Units/Facilities" instead of "Distributed Generators and Systems" in several places.]

[D.2.a.1 Resolution: ok]

(2) **Generating Facilities (Systems larger Greater than 11 kVA).** Electrical Corporations may have specific operating voltage ranges for ~~larger Distributed Generator units~~ Generating Facilities with Gross Nameplate Ratings greater than 11kVA, and may require adjustable operating voltage settings ~~for these larger systems~~. In the absence of such requirements, the Generating Facility shall operate at a range above principles of operating between 88% and 110% of the appropriate interconnection voltage ~~should be followed~~.

[D.2.a.2 PG&E / SCE: "(2) Large Systems (greater than 11kVA)-; [EC] may ... for larger ~~Distributed Generator units, Generating Facilities~~, and may ..."]

[D.2.a.1 SDG&E: no change]

[Werner Blumer, CPUC, 07092001: D.2.a.1 & D.2.a.2 Should say "Generating Units/Facilities" instead of "Distributed Generators and Systems" in several places.]

[ok]

(3) Voltage Disturbances. System voltage assumes a nominal 120 V base. ~~For the convenience of those wishing to translate these guidelines to voltage bases other than 120 volts, the limits will also be provided as approximate percentages.~~ The Distributed-Generator should sense abnormal voltage and respond accordingly. The following conditions should be met, with voltages in Root Mean Square and measured at the Point of Common Coupling, as described in Table D--1.

[D.2.a.3 SCE / PG&E: "...as approximate percentages. ~~The Distributed-Generator Generating Units~~ should sense

abnormal voltage and respond accordingly. The following conditions should..."

"...with voltages in RMS and measured at the Point of ..."]

[D.2.a.3 SDG&E: no change]

[Werner Blumer, CPUC, 07092001: D.2.a.3 Delete first two sentences, they are not necessary.]

[D.2.a.3 Resolution:]

Table D—1: Voltage Trip Setting

Voltage at Point of Common Coupling (Assuming 120V base)	Maximum Trip Time (Assuming 60 Cycles per Second)
Less than 60 Volts	10 Cycles
Greater than <u>or equal to</u> 60 VVolts but less than 106 Vvolts	120 Cycles
Greater than <u>or equal to</u> 106 volts but less than <u>or equal to</u> 132 VVolts	Normal Operation
Greater than 132 volts but less than <u>or equal to</u> 165 VVolts	120 Cycles (30 cycles for facilities greater than 11kVA)
Greater than 165 VVolts	6 Cycles

[Werner Blumer, CPUC, 07092001: Indicate nominal voltage as heading for the table].

** **Maximum Trip time**" refers to the time between the abnormal condition being applied and the ~~Distributed-Generator-unit-Generating Facility~~ ceasing to energize the Distribution System. Certain circuits will actually remain connected to the Distribution System to allow sensing of electrical conditions for use by the "reconnect" feature. The purpose of the allowed time delay is to ride through short-term disturbances to avoid excessive nuisance tripping. For ~~systems-Generating Facilities with a Gross Nameplate Rating of 11 kVA peak capacity~~ or less, the above set points are to be non-user adjustable. For*

Distributed Generator-Generating Facilities with a Gross Nameplate Rating of greater units larger than 11 kVA, different voltage set points and trip times from those in Table D.--1 may be negotiated with the interconnecting Electrical Corporation.

[Table D.1 PG&E / SCE: Table D.1 ... Maximum Trip Time* ... * "Trip time" refers ... and the ~~Distributed Generator-unit Generating Facility~~ ceasing to energize ~~the [EC]'s~~ Distribution System. ...connected to ~~[EC]'s the~~ Distribution System to allow... For Generating Facilities with a Gross Nameplate Rating systems of 11 kVA ~~peak~~ capacity or less, ... For ~~Distributed Generator units larger~~ Generating Facilities with a Gross nameplate Rating greater than 11 kVA, different voltage set points...negotiated with ~~the interconnecting Electrical Corporation [EC].~~"]

[Table D.1 SDG&E: no change]

[Werner Blumer, CPUC, 02162001: The percentages are not provided in the table.]

[Table D.1 Resolution:]

b. Flicker. Any voltage flicker at the Point of Common Coupling caused by the Generating Facility should not exceed the limits defined by the "Maximum Borderline of Irritation Curve" identified in IEEE 519 (IEEE Recommended Practices and Requirements for Harmonic Control in Electric Power Systems, IEEE STD 519-1992, Institute of Electrical and Electronic Engineers, Piscataway, NJ. April 1992. This requirement is necessary to minimize the adverse voltage effects experienced by ~~to~~ other customers on ~~the Electrical Corporation's~~ Distribution System. Induction ~~generators~~ Generators may be connected and brought up to synchronous speed (as an induction motor) provided these flicker limits are not exceeded.

[D.2.b SCE / PG&E: "...minimize the adverse voltage ~~affects experienced by~~ ~~effects to~~ other customers on ~~the [EC]'s~~ Distribution System. Induction ~~generators~~ Generating Units may be...]

[D.2.b SDG&E: no change]

[D.2.b Editor: SCE / PG&E use of the word "affects" is incorrect in this context; it should be "effects".

[D.2.b Resolution:]

c. Frequency. ~~The~~ Electrical Corporation controls system frequency, and the ~~Distributed Generator-Generating unit Facility~~ shall operate in synchronism with the Distribution System. ~~Small Distributed Generators-Generating Facilities with a Gross Nameplate Rating of 11 kVA or less shall~~ ould have a fixed operating frequency range of 59.3-60.5 Hertz. The ~~DG-Generating Facility~~ must cease to energize ~~the Electrical Corporation's Distribution S~~system in a maximum of ten cycles should ~~the EC-Distribution System~~ remain outside of the frequency limits. The purpose of the time delay is to allow the ~~DG~~ Generating Facility to ride through short-term disturbances to avoid ~~excessive~~ nuisance tripping. ~~Electrical Corporations~~ may require adjustable operating frequency settings for ~~systems-Generating Facilities with a Gross Nameplate Rating greater larger~~ than 11 kVA ~~to assist the system during serious capacity shortages.~~

[D.2.c PG&E / SCE: ~~The Electrical Corporation [EC]~~ controls system frequency, and the ~~Distributed Generator-unit Generating Facility~~ shall ... Small ~~Distributed Generators-Generating Facilities~~ should ... Hertz. The ~~DG~~ Generating Facility must cease ... cycles should ~~the EC [EC]~~ remain outside...

The purpose...allow the DG Generating Facility to ride... Electrical Corporations [EC] may require...for systems Generating Facilities larger than...serious capacity shortages. For Generating Facilities larger than 11 kVA, low frequency settings of 59.3 Hz and 58.0 Hz may be used with the consent of [EC]."]

[Werner Blumer, CPUC, 02162001: Explain the criteria for the two low frequency settings each utility specified for Generating Facilities. >11 kVA. This needs to be reflected here too.]

[D.2.c SDG&E: no change]

[D.2.c Resolution:]

d. Harmonics. Harmonic distortion shall be in compliance with IEEE 519. Exception: The harmonic distortion of a Distributed Generator Generating Facility located at a Customer's site shall be evaluated using the same criteria as for the loads at that site.

[D.2.d SCE / PG&E: "...of a Distributed Generator Generating Facility located at a Customer's site shall be evaluated..."]

[D.2.d SDG&E: no change]

[Werner Blumer, CPUC, 05142001: D.2.d Should read:"...criteria as for the loads at that site."]

[D.2.d Resolution:]

e. Direct Current Injection. The Distributed Generator Generating Facilities should not inject Direct Current greater than 0.5% of rated output current into the Electrical Corporation's Distribution System. under either normal or abnormal operating conditions.

[D.2.e SCE / PG&E: "Injection-: The Distributed Generator Generating Facilities should not...into the [EC]'s

Distribution System..."]

[D.2.e SDG&E: no change]

f. Power Factor. Each Distributed Generator in a Generating Facility shall be capable of operating at some point within a power factor range of a power factor of of 0.9 (either leading or and 0.9 lagging). Operation outside this range is acceptable provided the reactive power of the Generating Facility is used to meet the reactive power needs of on-site loads or that reactive power is otherwise provided under tariff by the Electrical Corporation. The Producer shall notify the Electrical Corporation if it is using the Generating Facility for power factor correction.

[D.2.f SCE / PG&E: "Power Factor-: Each Distributed Generator Generating Unit in a Generating Facility..."]

[D.2.f SDG&E: no change]

[Werner Blumer, CPUC, 05142001: D.2.f Should read:"... some point within a power factor range of..."] [D.2.f Resolution:]

[[STOPPED EDITING HERE==>]]

3. Control, protection and safety equipment requirements

[editor: PG&E placed this heading BASIC REQUIREMENTS below the heading Control, protection...and they added the Protective Function Requirements paragraph.]

[D.3. PG&E: "a. BASIC REQUIREMENTS

1) Protective Function Requirements. The protective Functions of a Generating Facility must include a visual open disconnect device (except as exempted in Section D.1.h.), a fault-interrupting device, an over/under voltage trip function, and an over/under frequency trip function.”]

[Editor: PG&E reference should be to D.1.i...there is no exemption in D.1.h]

[Werner Blumer, CPUC, 02162001: Suggest deletion of this title, or add a “General” title with the requirement for a visible disconnect switch, over/under voltage and frequency protection, etc.]

[Editor: Not sure whether Werner is referring to the D. section title or D.1.a subsection title.]

(1) **Limits specific to single-phase generators.** For single-phase generators connected to a shared single-phase secondary, the maximum capacity shall be 20 kVA. Distributed Generators applied on a center-tap neutral 240-volt service must be installed such that no more than 6 kVA of imbalance in capacity exists between the two sides of the 240-volt service. For dedicated distribution transformer services, the limit of a single-phase Distributed Generator shall be the transformer nameplate rating.

[D.3.0.1 SCE / PG&E: "(1) Limits ~~specific to single-phase generators. Specific to Single-Phase Generating Facilities:~~ For single-phase ~~generators-Generating Facilities~~ connected...20 kVA. ~~Distributed Generators Generating Facilities~~ applied on... For dedicated...a single-phase ~~Distributed Generator Generating Facility~~ shall be..."

[D.3.1 SDG&E: No change.]

[Werner Blumer, CPUC, 02162001: This section is also a “Technology Specific Requirement” and should be listed under D.3.b. as “Single Phase Generators”. Should read:” ...secondary circuit...”]

[Werner Blumer, CPUC, 05142001: D.3.a If the balancing requirement is for a shared transformer, who coordinates this? Should this requirement be in the screening diagram?]

a. Technology Specific Requirements

[Editor: SCE placed this heading Technology Specific Requirements just below the heading Control, protection, as noted in previous comment. That agrees with Werner's comment above.]

[Editor: SCE has renumbered the sub-sub-sections (a,b,c...) of D.3 so that a. is "Technology Specific Requirements"; b. is "Supplemental Generating Facility Requirements" (equivalent to d. here); c. is "Generating Facility Types and Conditions" (equivalent to e. here). PG&E has left sub-sub section numbering unchanged.]

(2) **Three-phase synchronous generators.** The Distributed Generator circuit breakers shall be three-phase devices with electronic or electromechanical control. The Producer shall be responsible for properly synchronizing its Generating Facility with the Distribution System by means of either a manual or automatic synchronizing function. Automatic synchronizing is required for all synchronous generators, which have a Short Circuit Contribution Ratio (SCCR) exceeding 0.05. A Generating Facility whose SCCR exceeds 0.05 shall be equipped with Protective Functions suitable for detecting loss of synchronism and rapidly disconnecting the Generating Facility from the Distribution System. Unless otherwise agreed to between the Producer and the Electrical Corporation, synchronous generators shall automatically regulate power factor, not voltage, while operating in parallel with the

Distribution System. Power system stabilization is specifically not required for Generating Facilities under 10 MW.

Synchronization: At the time of connection, the frequency difference shall be less than 0.2 Hz, the voltage difference shall be less than 10%, and the phase angle difference shall be less than 10 degrees.

[D.3.a.2 SCE / PG&E: "(2) Three-phase synchronous ~~generators~~. Generating Facilities: For three-phase Generating Facilities, the Distributed Generator Generating Facility circuit breakers shall be... required for all synchronous ~~generators~~ Generating Units, which have a...exceeding 0.05. A Generating Facility Unit whose... Unless otherwise agreed ~~to between the Electricity upon by the~~ Producer and ~~the Electrical Corporation [EC]~~, synchronous ~~generators~~ Generating Units shall automatically...Generating Facilities under 10 MW Gross Nameplate Capacity. ... Synchronization: Synchronization means that A at the time..."]

[D.3.a.2 SDG&E: no change]

[Werner Blumer, CPUC, 05142001: D.3.b.1 It is not clear what "Power System stabilization" refers to in second to last sentence. EP has not control over the EC's system.]

[D.3.a.2 Resolution:]

(3) **Induction Generators.** Induction Generators do not require separate synchronizing equipment. Starting or rapid load fluctuations on induction generators can adversely impact the Distribution System's voltage. Corrective step-switched capacitors or other techniques may be necessary and may cause undesirable ferroresonance. When these counter measures (e.g. additional capacitors) are installed on the Producer's side of the Point of Common Coupling, the Electrical Corporation must review these measures. Additional equipment may be required to resolve this problem as a result of an Interconnection Study.

[D.3.a.3 PG&E / SCE: "(3) Induction Generators: Induction Generators-generator Generating Units do not ... Additional equipment...resolve this problem as ~~a result of~~ determined in an..."]

[D.3.a.3 SDG&E: No change.]

[Werner Blumer, CPUC, 05142001: D.3.a.3 What does "separate " synchronizing equipment refer to?]

(4) **Inverter Systems.** Utility-interactive inverters do not require separate synchronizing equipment. Non-utility-interactive stand-alone inverters shall not be used for parallel operation with the Distribution System.

[D.3.a.4 PG&E / SCE: "...Non-utility-interactive ~~stand-alone~~ , or "stand-alone" inverters shall not..."]

[D.3.a.4 SDG&E: No change.]

b. Initial Review process

Section I of this Rule defines the Initial Review process. The Initial Review process evaluates the specific characteristics of the Interconnection, including those specific to the location of the Generating Facility, and whether additional requirements are necessary.

[RealEnergy, 02012001- Comment on SCE Advice Filing. Sheet 12, D.3.b: Very ambiguous and subjective requirements. Why are standards any different than they would be for installing an electric motor under NEC? (National Electric Code)]

[D.3.b PG&E: "Initial Review ~~p~~rocess... Appendix A Section I of this...and whether or not additional..."]

[D.3.b SCE: "Initial Review process Section I of this Rule defines the Initial Review process. The Initial Review process evaluates the specific characteristics of the Interconnection, including those specific to the location of the Generating Facility, and whether additional requirements are necessary."
"]

[D.3.b SDG&E: no change]

[Werner Blumer, CPUC, 02162001: This section seems out of place and unnecessary.]

[D.3.b Resolution:]

c. Supplemental DG Requirements

[Werner Blumer, CPUC, 07092001: D.3.c Change title to "Supplemental Interconnection and Protection Requirements"]

(1) Unintended Islanding For DG that fail the Export Screen.

Generating Facilities must mitigate their potential contribution to an Unintended Island. This can be accomplished by one of the following options: (1) incorporating certified non-islanding control functions into the Protective Functions, or (2) verifying that local loads sufficiently exceed the load carrying capability of the Generating Facility, or (3) transfer trip or equivalent function.

[D.3.c.1 SCE & PG&E: "Unintended Islanding For DG Generating Facilities that fail ... (1) incorporating certified Non-Islanding non-islanding control ... into the Protective Functions, ~~or~~ (2) verifying that... or (3) incorporating transfer trip or an equivalent function in the Protective Functions. "]

[D.3.c.1 SDG&E: no change]

[RealEnergy, 02012001- Comment on SCE Advice Filing. Sheet 13, D.3.d(1) [editor: should be D.3.c.1]: How do we verify that local loads sufficiently exceed the load carrying capability?]

[Werner Blumer, CPUC, 02162001, D.3.c.1: transfer trip needs a definition.]

[Werner Blumer, CPUC, 05142001: D.3.c.1 Should "load carrying capability" read "steady state or nominal capacity"?]

[Werner Blumer, CPUC, 07092001: D.3.c.1 Change title to "Unintended Islanding of Exporting Generating Facilities "(2) What is the definition of "local"?]

[D.3.c.1 Resolution:]

(2) Fault Detection. A Generating Facility with an SCCR exceeding 0.1 or that does not meet any one of the options for detecting Unintended Islands in D.4.d.1 shall be equipped with Protective Functions designed to detect Distribution System faults, both line-to-line and line-to-ground, and promptly remove the Generating Facility from the Distribution System in the event of a fault. For a Generating Facility that cannot detect these faults within two seconds, transfer trip or equivalent function may be required. Reclose-blocking of the Electrical Corporation's affected recloser(s) may also be required by the Electrical Corporation for generators that exceed 15% of the peak load on the Line Section.

[D.3.c.2 Editor: The reference in D.3.c.2 "...Unintended Islands in D.4.d.1" should be changed to D.3.c.1]

[SCE / PG&E: "...may also be required by ~~[EC] the Electrical Corporation~~ for ~~generators~~ Generating Facilities that exceed..."]

[D.3.c.2 SDG&E: no change]

[Werner Blumer, CPUC, 02162001: "...detect..." should read "...minimize..." "Transfer trip" needs definition. "...promptly..." needs to be specified as to time.]

d. Generating Facility types and conditions not identified. In the event that Section D. of this rule does not address the interconnection requirements of a Generating Facility, the Electrical Corporation and Producer may interconnect a Generating Facility using mutually agreed upon technical requirements.

[SCE / PG&E: "...In the event that Section D. of this ~~rule~~ Rule does not...~~[EC]~~ and ~~Electricity~~ Producer may ~~interconnect a Generating Facility using mutually agreed upon technical requirements~~ agree upon the technical requirements to interconnect the Generating Facility."]

[Werner Blumer, CPUC, 07092001: D.3.d Should read " The EC and EP may agree on other technical interconnection requirements for Generating Facilities not covered by Section 4".]

E. INTERCONNECTION FACILITY OWNERSHIP AND FINANCING

1. Scope and Ownership of Interconnection Facilities

a. Scope. The interconnection of a Producer's Generating Facility with Electrical Corporation's Distribution System is made through the use of Interconnection Facilities. Such interconnection may also require Distribution System improvements. The type, extent and costs of Interconnection Facilities and Distribution System Improvements shall be consistent with this Rule and determined through the Initial Review and/or Interconnection Study described in Section C.

b. Ownership. Interconnection Facilities installed on Producer's side of the Point of Common Coupling may be owned, operated and maintained by the Producer or Electrical Corporation. Interconnection Facilities installed on Electrical Corporation's side of the Point of Common Coupling and Distribution System improvements shall be owned operated and maintained by Electrical Corporation.

2. Responsibility for Costs of Interconnecting a Generating Facility

a. Study and Review Costs. A Producer shall be responsible for the reasonably incurred costs of the reviews and studies conducted pursuant to Section C.1.b of this Rule.

b. Facility Costs. A Producer shall be responsible for all costs associated with Interconnection Facilities owned by the Producer. The Producer shall also be responsible for any costs reasonably incurred by Electrical Corporation in providing, operating, or maintaining Interconnection Facilities and Distribution System improvements required solely for the interconnection of the Producer's Generating Facility with Electrical Corporation's Distribution System.

c. Separation of Costs. Should Electrical Corporation combine the installation of Interconnection Facilities, or Distribution System Improvements with modifications or additions to the Electrical Corporation's Distribution System to serve other Customers or Producers, Electricity Corporation shall not include the costs of such separate or incremental facilities in the amounts billed to the Producer for the Interconnection Facilities or Distribution System Improvements required pursuant to this Rule.

3. Installation and Financing of Distribution System Improvements

a. Agreement Required. Costs for Added Facilities shall be paid by the Producer pursuant to the provisions contained in the Generating Facility Interconnection Agreement. Where the type and extent of the Interconnection Facilities and Distribution System Improvements warrant additional detail, the detail shall be found in a separate agreement between the Producer and Electrical Corporation, and Electrical Corporation's applicable tariff Schedules and rules for Added Facilities.

b. Attachments and Modifications to Distribution System. Except as provided for in Section E.3.c of this Rule, Interconnection Facilities connected directly to Electrical Corporation's Distribution System and Distribution System Improvements shall be provided, installed, owned and maintained by Electrical Corporation as Special Facilities.

c. Third-Party Installations. Subject to the approval of Electrical Corporation, a Producer may, at its option, employ a qualified contractor to provide and install Interconnection Facilities or Distribution System improvements to be owned and operated by Electrical Corporation. Such Interconnection Facilities and Distribution System improvements shall be installed in accordance with Electrical Corporation's design and specifications. Upon final inspection and acceptance by Electrical Corporation, the Producer shall transfer ownership of such Producer installed Interconnection Facilities or Distribution System Improvements to Electrical Corporation and such facilities shall thereafter be owned and maintained by Electrical Corporation at Producer's expense as Added Facilities. The Producer shall pay the Electrical Corporation's reasonable cost of design, administration, and monitoring of the installation for such facilities to ensure compliance with Electrical Corporation's requirements. Producer shall also be responsible for all costs, including any income tax liability, associated with the transfer of Producer installed Interconnection Facilities and Distribution System Improvements to Electrical Corporation.

d. Reservation of Unused Facilities. When a Producer wishes to reserve Electrical Corporation-owned Interconnection Facilities or Distribution System

Improvements installed and financed as Special Facilities for the Producer, but idled by a change in the operation of the Producer's Generating Facility or otherwise, Producer may elect to abandon or reserve such facilities consistent with the terms of its agreement with Electrical Corporation. If Producer elects to reserve idle Interconnection Facilities or Distribution System Improvements, Electrical Corporation shall be entitled to continue to charge Producer for the costs related to the ongoing operation and maintenance of the Added Facilities.

e. **Refund of Salvage Value.** When a Producer elects to abandon the Special Facilities for which it has either advanced the installed costs or constructed and transferred to the Electrical Corporation, the Producer shall, at a minimum, receive from the Electrical Corporation a credit for the net salvage value of the Special Facilities.

F. METERING, MONITORING AND TELEMETRY

1. General Requirements. All Generating Facilities shall be metered in accordance with this Section F and shall meet all applicable standards of the Electrical Corporation contained in the Electrical Corporation's applicable tariffs and published Electrical Corporation manuals dealing with metering specifications. The requirements in this Section F do not apply to metering of Generating Facilities operating under the Electrical Corporation's Net Energy Metering tariff pursuant to California Public Utilities Code Section 2827.

2. Metering by non-Electrical Corporation Parties. The ownership, installation, operation, reading, and testing of metering for Generating Facilities shall be by the Electrical Corporation except to the extent that the Commission has determined that all these functions, or any of them, may be performed by others as authorized by the Commission.

3. Net Generation Metering. Net Generation Metering may be required for purposes of monitoring Generating Facility operation. Electrical Corporation shall have the right to specify the type and require the installation of Net Generation Metering, where applicable, for the purpose of determining efficiency requirements, cogeneration gas allowance, standby charges pursuant to EC's Standby tariff schedules, applicable non-bypassable charges as defined in Electrical Corporation's tariff schedules, and Distribution System planning and operations, consistent with Section B.4 of this Rule. ~~for determination of standby charges and applicable non-bypassable charges as defined in Electrical Corporation's Tariff Schedules, and for Distribution System planning and operations, consistent with Section B.4 of this Rule, Electrical Corporation shall have the right to specify the type, and require the installation of, Net Generation Metering.~~ The

Electrical Corporation ~~shall~~ may require the provision of Generating Facility output data to the extent reasonably necessary to provide information for ~~the utility~~ Electrical Corporation to administer its tariffs schedules, programs, or to operate and plan its Distribution system. Electrical Corporation shall only require Net Generation Metering to the extent that less intrusive and/or more cost effective options for providing the necessary generator output data are not available. In exercising its discretion to require Net Generation Metering, Electrical Corporation shall consider all relevant factors, including but not limited to:

- a. Producer election to install equipment that adequately addresses the Electrical Corporation's operational requirements;
- b. Accuracy, type and cost of required metering consistent with purposes of collecting data;
- c. The project's size relative to the cost of the metering/monitoring;
- d. Other means of obtaining the data (e.g. generator logs, proxy data etc.);
- e. Requirements under the Interconnection Agreement.

The Electrical Corporation will report to the Commission or designated authority, on a quarterly basis, the rationale for requiring Net Generation Metering Equipment in each instance along with the size and location of the facility.

4. Point of Common Coupling Metering. For purposes of assessing Electrical Corporation charges for retail service, the Producer's Point of Common Coupling Metering may require a bi-directional meter so that energy deliveries to and from the Producer's site can be separately recorded. Alternately, the Producer may, at its sole option and cost, require the Electrical Corporation to install multi-metering equipment to separately record energy deliveries to the Distribution System and retail purchases from the Electric Corporation. Such Point of Common Coupling Metering shall be designed to prevent reverse registration.

5. Telemetering. If the Net Nameplate Rating of the Generating Facility is 1 MW or greater, Telemetering equipment at the Net Generation Metering location may be required at the Producer's expense. If the Generating Facility is interconnected to a Distribution System operating at a voltage below 10kV, then Telemetering equipment may be required on Generating Facilities 250 kW or greater. The Electrical Corporation shall only require Telemetering to the extent that less intrusive or more cost effective options for providing the necessary data in real time are not available. The Electrical Corporation will report to the Commission or designated authority, on a quarterly

basis, the rationale for requiring Telemetry equipment in each instance along with the size and location of the facility.

6. Sunset Provision. Sections F.3 and F.5 are interim provisions only. The Electrical Corporation shall file permanent metering requirements with the Commission on or by December 31, 2002. At that time, the Electrical Corporation shall serve its application for approval of permanent metering requirements on the service list in Order Instituting Rulemaking 99-10-025.

7. Location. Where Electrical Corporation-owned Metering is located on the Producer's premises, Producer shall provide, at no expense to Electrical Corporation, a suitable location for and access to all such Metering **Equipment**.

[Editor 12042001: Cross-check with Dylan's rewrite of the definitions of Metering & Metering Equipment.]

8. Costs of **metering Metering Equipment and Metering.** The Producer will bear all costs of the Metering Equipment required by this Rule and applicable tariff schedules, including the incremental costs of operating and maintaining the Metering.

[Editor 12042001: Cross-check with Dylan's rewrite of the definitions of Metering & Metering Equipment.]

G. DISPUTE RESOLUTION PROCESS

1. The following procedures will apply for disputes arising from this Rule: The Commission shall have initial jurisdiction to interpret, add, delete or modify any provision of this Rule or of any agreements entered into between the Electrical Corporation and the Producer to implement this **tariff Rule** (~~"the implementing agreements"~~) and to resolve disputes regarding ~~the~~ Electrical Corporation's performance of its obligations under its ~~electric rules and~~ **tariff schedules**, the **implementing applicable** agreements, and requirements related to the interconnection of the Producer's **Generating or Interconnection** Facilities pursuant to this Rule .

[G.1 SCE / PG&E: "**The following procedures will apply for disputes arising from this Rule:** The **CPUC Commission** shall have initial jurisdiction to interpret, add, delete or modify any provision of this Rule or of any agreements entered into between ~~the Electrical Corporation [EC]~~ and the ~~Electricity~~ Producer to implement this tariff (~~"the implementing A agreements"~~) and to resolve disputes regarding ~~the Electrical Corporation' [EC]~~'s performance of its obligations under its ~~electric rules and t~~ariffs **Schedules**, the implementing agreements, and requirements related to the interconnection of the ~~Electricity~~ Producer's **Generating or Interconnection** Facilities pursuant to this Rule ."]

[G.1 SDG&E: no change]

[G.1 Resolution: **ok**]

2. Any dispute arising between ~~the~~ Electrical Corporation and the Producer (individually "Party" and collectively "the Parties") regarding the Electrical Corporation's performance of its obligations under its ~~electric rules and~~ **tariff schedules**,

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the ~~implementing applicable~~ agreements, and requirements related to the interconnection of Producer's Generating or Interconnection Facilities pursuant to this Rule shall be resolved according to the following procedures.

[G.2 PG&E: "...under its ~~electric rules and Tariffs Schedules~~, the implementing agreements..."]

[G.2 SCE: "...under its ~~electric rules and Tariffs Schedules~~, ~~t~~The ~~i~~implementing ~~a~~Agreements..."]

[G.2 SDG&E: no change]

[G.2 Resolution:]

a. The dispute shall be reduced to writing by the aggrieved Party in a letter ("the dispute letter") to the other Party containing the relevant known facts pertaining to the dispute, the specific dispute and the relief sought, and express notice by the aggrieved Party that it is invoking the procedures under Section G.2. Within 45 calendar days of the date of the dispute letter, the Parties' authorized representatives will be required to meet and confer to try to resolve the dispute.

b. If the Parties do not resolve their dispute within 45 calendar days after the date of the dispute letter, the dispute shall, upon demand of either party, be submitted to resolution before the Commission in accordance with the Commission's rules of Practice and ,regulations and pProcedures aApplicable to ~~the resolution of such disputes~~Customer Complaints.

[G.2.b PG&E: "...in accordance with PG&E's Rule 10 and the Commission's Rules, ~~,regulations of Practice~~ and Procedures Applicable to ~~the resolution of such disputes~~ Customer Complaints."]

[G.2.b SCE: "...in accordance with the Commission's rules, ~~,regulations of Practice~~ and pProcedures aApplicable to ~~the resolution of such disputes~~ Customer Complaints."]

[G.2.b SDG&E: no change]

[G.2.b Resolution: SCE]

3. Pending resolution of any dispute under this section, the Parties shall proceed diligently with the performance of their respective obligations under this Rule and the ~~implementing applicable~~ agreements, unless the ~~implementing applicable~~ agreements have been terminated.

a. Disputes as to the aApplication and implementation of ~~this s~~Section G of this Rule shall be subject to resolution pursuant to the procedures set forth in this section.

[G.3 SCE / PG&E: Capitalize "S" in Section; capitalize the word "Application" in G.3.a; place G.3.a into the paragraph at G.3.]

[G.3 SCE Capitalize the first letters in the phrase "The Implementing Agreements" in both occurrences.]

[G.3. SDG&E: No change]

[G.3 Resolution:]

H. DEFINITIONS

[[check against meeting notes]]

Active Anti-Islanding Scheme: A control scheme installed with the Generating Facility that senses and prevents the formation of an Unintended Island.

Applicant: The entity submitting an Application for Interconnection pursuant to this Rule.

Application: A Commission-approved standard form submitted to the Electrical Corporation for Interconnection of a Generating Facility.

Certification Test: A test pursuant to this Rule that verifies conformance of certain equipment with Commission-approved performance standards in order to be classified as Certified Equipment. Certification Tests are performed by NRTLs.

Certification; Certified; Certificate: The documented results of a successful Certification Testing.

Certified Equipment: Equipment that has passed all required Certification Tests.

Commission: The Public Utilities Commission of the State of California.

Commissioning Test: A test performed during the commissioning of all or part of a DG system to achieve one or more of the following:

- Verify specific aspects of its performance;
- Calibrate its instrumentation;
- Establish instrument or Protective Function set-points.

Customer: The entity that receives or is entitled to receive Distribution Service through the Distribution System.

Dedicated Transformer; Dedicated Distribution Transformer: A transformer that provides Electricity Service to a single Customer. The Customer may or may not have a Generating Facility.

Generator: An individual electrical power plant (including required equipment, appurtenances, protective equipment and structures) that is capable of Distributed Generation. A Generator is part of a Generating Facility.

Distribution Service: All services required by, or provided to, a Customer pursuant to the approved tariffs and rules of the Electrical Corporation.

Distribution System: All electrical wires, equipment, and other facilities owned or provided by the Electrical Corporation by which an Electrical Corporation provides Distribution Service to its Customers.

Electrical Corporation (EC): The entity that, under the jurisdiction of the Commission, is charged with providing Electricity Distribution Service to the Customer. Electrical Corporations may substitute their own names for EC.

Emergency: An actual or imminent condition or situation, which jeopardizes the Distribution System Integrity.

Field Testing: Testing performed in the field to determine whether equipment meets the Electrical Corporation's requirements for safe and reliable Interconnection

Generating Facility: All Generators that are included in an Interconnection Agreement.

Gross Nameplate Rating: The total gross generating capacity of a Generator or Generating Facility as designated by the manufacturer of the Generator.

Host Load: Electrical power that is consumed by the Customer at the property on which the Generating Facility is located.

Initial Review: The review by the Electrical Corporation, following receipt of an Application, to determine the following:

Either:

- a) the Generating Facility qualifies for Simplified Interconnection; or
- b) the Generating Facility can be made to qualify for Interconnection with Supplemental Review determining any potential additional requirements; and if neither a nor b, provides the cost estimate and schedule for performing an Interconnection Study

In-rush Current: The current determined by the In-rush Current Test.

Interconnection Agreement: An agreement between the Electrical Corporation and the Producer that gives certain rights and obligations to effect or end Interconnection.

Interconnection Study: A study to establish the requirements for Interconnection of a Generating Facility.

Interconnection; (Interconnected): The physical connection of a Generating Facility in accordance with the requirements of this Rule so that Parallel Operation with the Distribution System can occur (has occurred).

Interconnection Facilities: The electrical wires, switches and related equipment that interconnect a Generating Facility to the Distribution System.

Island; Islanding: A condition on the Distribution System in which one or more Generating Facilities deliver power to Customers using a portion of the Distribution System that is electrically isolated from the remainder of the Distribution System.

Line Section: That portion of the Distribution System connected to a Customer bounded by automatic sectionalizing devices or the end of the distribution line.

Metering Equipment: All equipment, hardware, software including meter cabinets, conduit, etc. that is necessary for Metering.

Metering: The measurement of electrical power or energy in kW and/or kWh respectively, and, if necessary, reactive power in kVAR and its delivery to the Electrical Corporation, as required by this Rule.

Momentary Parallel: The interconnection of a Generating Facility to the Distribution System for one second (60 cycles) or less.

Nationally Recognized Testing Laboratory (NRTL): A laboratory accredited to perform the certification testing requirements under this Rule.

Net Energy Metering: Metering for the receipt and delivery of electricity between the Producer and the Electrical Corporation pursuant Section 2827 of the Public Utilities Code. Over a given time frame (typically a month) the difference between these two values yields either net consumption or surplus. The meter registers are ratcheted to prevent reverse registration. If available, a single meter may be allowed spin backward to yield the same effect as a directional two meter (or register) arrangement.

[Editor: Dylan S. to check this definition.]

Net Generation Metering: Metering of the net electrical power or energy output in kW or kWh respectively from a given Generating Facility. This may also be the measurement of the difference between the total electrical energy produced by a Distributed Generator and the electrical energy consumed by the auxiliary equipment necessary to operate the Distributed Generator. For a Generating Facility with no Host Load and/or no Public Utilities Code Section 218 Load, Metering that is located at the point of Common Coupling. For a Distributed Generator with Host Load and/or Section 218 Load, Metering that is located at the Distributed Generator bus after the point of auxiliary load(s) and prior to serving Host Load and/or Section 218 Load.

Net Nameplate Rating: The Gross Nameplate Rating minus the consumption of electrical power of a Generator or Generating Facility as designated by the manufacturer(s) of the Distributed Generator or engineer.

Network Service: More than one electrical feeder providing Distribution Service at a Point of Common Coupling.

Non-Export; Non-Exporting: Designed to prevent the transfer of electrical energy from the EP to the EC.

Non-Islanding: Designed to detect and disconnect from a stable Unintended Island with matched load and generation. Reliance solely on under/over voltage and frequency trip is not considered sufficient to qualify as Non-Islanding.

Parallel Operation: The simultaneous operation of a Generator with power delivered or received by the Electrical Corporation while Interconnected. For the purpose of this rule, Parallel Operation includes only those generators that are so interconnected with the Distribution System for more than one second (60 cycles).

Periodic Test: A test performed on part or all of a Generating Facility at pre-determined time or operational intervals to achieve one or more of the following:

- Verify specific aspects of its performance;
- Calibrate instrumentation;
- Verify and re-establish instrument or Protective Function set-points.

Point of Common Coupling Metering: Metering located at the Point of Common Coupling. This is the same Metering as Net Generation Metering for Generating Facilities with no Host Load and/or no Section 218 Load.

Point of Common Coupling (PCC): The transfer point for electricity between the electrical conductors of the Electrical Corporation and the electrical conductors of the Producer.

Point of Interconnection: The electrical transfer point between a Generator or a Generating Facility and the electrical system. This may or may not be coincident with the Point of Common Coupling.

Power Purchase Agreement(PPA): An agreement for the sale of electricity by the Producer to the Electrical Corporation.

Producer: The entity that executes an Interconnection Agreement with the Electrical Corporation. The Producer may or may not own or operate the Generating Facility, but is responsible for the rights and obligations related to the Interconnection Agreement.

Production Test: A test performed on each device coming off the production line to verify certain aspects of its performance.

Protective Function(s): The equipment, hardware and/or software in a Generating Facility (whether discrete or integrated with other functions) whose purpose is to protect against Unsafe Operating Conditions.

Prudent Electrical Practices: Those practices, methods, and equipment, as changed from time to time, that are commonly used in prudent electrical engineering and operations to design and operate electric equipment lawfully and with safety, dependability, efficiency, and economy.

Scheduled Operation Date: The date specified in the Interconnection Agreement when the Generating Facility is, by the Producer's estimate, expected to begin operation pursuant to this Rule.

Secondary Network: A network supplied by several primary feeders suitably interlaced through the area in order to achieve acceptable loading of the transformers under emergency conditions and to provide a system of extremely high service reliability. Secondary networks usually operate at 600 V or lower.

Section 218 Load: Electrical power that is supplied in compliance with California Public Utilities Code Section 218. Public Utilities Code 218 defines an "Electric Corporation" and provides conditions under which a generator transaction would not classify a generating entity as an Electric Corporation. These conditions relate to "over-the-fence" sale of electricity from a generator without using the Distribution System.

Simplified Interconnection: Interconnection conforming to the minimum requirements under these rules, as determined by Section I.

Short Circuit Contribution Ratio (SCCR): The ratio of the Generating Facility's short circuit contribution to the Electrical Corporation's short circuit contribution for a three-phase fault at the high voltage side of the distribution transformer connecting the Generating Facility to the Electrical Corporation's system.

Single Line Diagram; Single Line Drawing: A schematic drawing, showing the major electrical switchgear, protection devices, wires, generators, transformers and other devices, providing sufficient detail to communicate to a qualified engineer the essential design and safety of the system being considered.

Stabilization; Stability: The return to normalcy of an Electrical Corporation Distribution System, following a disturbance. Stabilization is usually measured as a time period during which voltage and frequency are within acceptable ranges.

Starting Voltage Drop: The percentage voltage drop at a specified point resulting from In-rush current. The Starting Voltage Drop can also be expressed in percentage of volts on a particular base voltage, (eg. 6 volts on a 120-volt base, yielding a 5% drop).

Supplemental Review: A process wherein the Electrical Corporation further reviews an Application that fails one or more of the Initial Review Process screens. The Supplemental Review may result in one of the following: a) Simplified Interconnection; b) approval of Interconnection with additional requirements; or c) cost and schedule for an Interconnection Study.

System Integrity: The condition under which a Distribution System is deemed safe and can reliably perform its intended functions in accordance with the safety and reliability rules of the Electrical Corporation.

Telemetry: The electrical or electronic transmittal of Metering data in real-time to the Electrical Corporation.

Transfer Trip: A Protective Function that trips a Generating Facility remotely by means of an automated communications link controlled by the Electric Corporation.

Type Test: A test performed on a sample of a particular model of a device to verify specific aspects of its design, construction and performance.

Unintended Island: The creation of an island, usually following a loss of a portion of the Distribution System, without the approval of the Electrical Corporation.

Unsafe Operating Conditions: Conditions that, if left uncorrected, could result in harm to personnel, damage to equipment, loss of System Integrity or operation outside pre-established parameters required by the Interconnection Agreement.

Visible Disconnect: An electrical switching device that can separate the Generating Facility from the Distribution System and allows visible verification that separation has been accomplished.

I. Initial Review Process for Applications to Interconnect Distributed Generation

[[Font/style check]]

[Chuck Whitaker, 09142001: I think it's important that one result of the Supplemental Review might still be Simplified Interconnection. There may be other places where similar changes are necessary, and the utilities may have some objections to my rewording but I thought I would offer them anyway. This ... suggests that in the IRP, for each step where it says, for example: "If Yes, the Generating Facility does not qualify for Simplified Interconnection; Perform supplemental review:" should be changed to:

"If Yes, the Generating Facility MAY not qualify for Simplified Interconnection. Perform supplemental review;"

Or:

"If Yes, the Generating Facility does not AUTOMATICALLY qualify for Simplified Interconnection. Perform supplemental review."]

1. Introduction

This Initial Review Process was developed to create a path for selection and rapid approval for the Interconnection of those Generating Facilities that do not require an Interconnection Study.

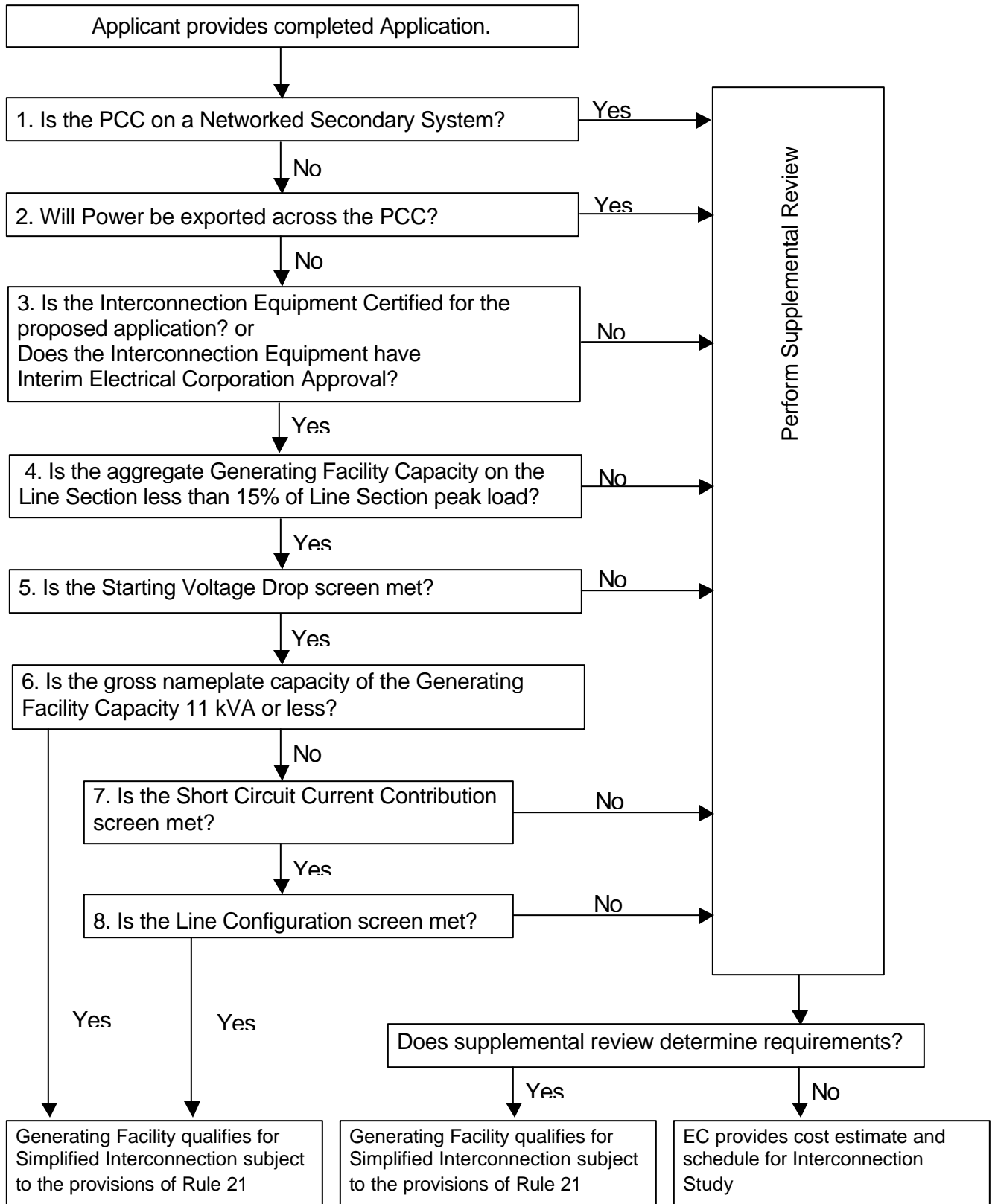
2. Purpose

The Initial Review determines:

- a. If a Generating Facility qualifies for Simplified Interconnection;
- b. If a Generating Facility can be made to qualify for Interconnection with supplemental review determining any potential additional requirements, or
- c. If an Interconnection Study is required, the cost estimate and schedule for performing the Interconnection Study.

NOTE: Failure to pass any screen of the Initial Review means only that further review, and/or studies, are required before the Generating Facility can be approved for interconnection with the Electrical Corporation Distribution System. It does not mean that the Generating Facility cannot be interconnected.

Initial Review Process Flow Chart



3. Initial Review Process Details

a. Screen 1: Is the PCC on a Networked Secondary System?

- If No, continue to next screen.
- If Yes, the Generating Facility does not qualify for Simplified Interconnection. Perform supplemental review.

Significance:

Special considerations must be given to Generating Facilities proposed to be installed on networked secondary distribution systems because of the design and operational aspects of network protectors. There are no such considerations for radial distribution systems.

b. Screen 2: Will power be exported across the PCC?

- If Yes, the Generating Facility does not qualify for Simplified Interconnection. Perform supplemental review.
- If No, the Generating Facility must incorporate one of the following four options:

Option 1:

To insure power is never exported, a reverse power Protective Function must be implemented at the PCC.

Default setting shall be 0.1% (export) of transformer rating, with a maximum 2.0 second time delay.

Option 2:

To insure at least a minimum import of power, an under-power Protective Function must be implemented at the PCC.

Default setting shall be 5% (import) of the Generating Facility Gross Nameplate Rating, with maximum 2.0 second time delay.

Option 3:

To limit the incidental export of power, all of the following conditions must be met:

The aggregate capacity of the Generating Facility must be no more than 25% of the nominal ampere rating of the Customer's Service Equipment;

The total aggregate Generating Facility capacity must be no more than 50% of the service transformer rating. (This capacity requirement does not apply to Customers taking primary service without an intervening transformer);

The Generating Facility must be certified as Non-Islanding.

Option 4:

To insure that the relative size (capacity) of the Generating Facility compared to facility load results in no export of power without the use of additional devices, the Generating Facility capacity must be no greater than 50% of the Customer's verifiable minimum load over the last 12 months.

Significance:

(1) If it can be assured that the Generating Facility will not export power, EC's Distribution System does not need to be studied for load-carrying capability or Generating Facility power flow effects on EC voltage regulators as the Generating Facility will simply be reducing Customer's load on EC's Distribution System.

(2) Permits use of reverse-power relaying at the PCC as positive anti-islanding protection.

c. Screen 3: Is the Interconnection Equipment Certified for the Application or does the Interconnection Equipment have Interim EC Approval?

- If No, the Generating Facility does not qualify for Simplified Interconnection. Perform supplemental review.
- If Yes, continue to next screen.

Significance:

If the Generating Facility has been Certified or previously approved by EC, the Electrical Corporation does not need to repeat its review and/or test of the Generating Facility's Protective Functions scheme. Site Commissioning Testing may still be required to insure that the system is connected properly and that the protective functions are working properly.

Certification indicates the following criteria have been tested and verified:

- Basic protective function requirements .
- Harmonic distortion limits.
- Synchronizing requirements .
- Power factor regulation requirements.
- Non-islanding requirements .
- If used, reverse power function requirement .
- If used, under-power function requirement.

d. Screen 4: Is the aggregate Generating Facility Capacity on the Line Section less than 15% of Line Section Peak Load?

- If Yes, continue to next screen.
- If No, Generating Facility does not qualify for Simplified Interconnection. Perform supplemental review to determine cumulative impact on Line Section.

Significance:

Low penetration of Generating Facility installations will have a minimal impact on Distribution System and load operation and power restoration.

The operating requirements for a high penetration of Generating Facilities may be different since the impact on PG&E's Distribution System operation will no longer be minimal, therefore requiring additional study or controls.

e. Screen 5: Is the Starting Voltage Drop screen met?

- If Yes, continue to next screen.
- If No, the Generating Facility does not qualify for Simplified Interconnection. Perform supplemental review to determine cumulative impact on Line Section

NOTICE: This screen only applies to Generating Facilities that start by motoring the Generator.

EC has two options in determining whether Starting Voltage Drop could be a problem; which option to use is at the EC's discretion.

Option 1:

EC may determine that the Generating Facility's starting Inrush Current is equal to or less than the continuous ampere rating of the Customer's service equipment.

Option 2:

EC may determine the impedances of service distribution transformer (if present) and secondary conductors to Customer's service equipment and perform a voltage drop calculation. Alternatively, EC may use tables or nomographs to determine the voltage drop. Voltage drops caused by starting a Generating Unit as a motor must be less than 2.5% for primary interconnection and 5% for secondary interconnection.

Significance:

- (1) This screen addresses potential voltage fluctuation problems for generators that start by motoring.
- (2) When starting, a Generating Facility should have minimal impact on the service voltage to other EC Customers.

(3) Passing this screen does not relieve the Producer from ensuring that its Generating Facility complies with the flicker requirements of Rule 21, Section D.

f. Screen 6: Is the Gross Nameplate Capacity of the Generating Facility 11 kVA or less?

[Resolution: pg&e ... done]

[Editor: Shouldn't this read "Gross Nameplate Rating"? GNC is not a defined term.]

[Editor: Make flowchart consistent with above.]

- If yes, the Generating Facility qualifies for Simplified Interconnection. Skip remaining screens.
- If No, continue to next screen.

Significance:

The Generating Facility has minimal impact on fault current levels and any potential line overvoltages from loss of system neutral grounding.

g. Screen 7: Is Short Circuit Current Contribution screen met?

- If No, the Generating Facility does not qualify for Simplified Interconnection. Perform supplemental review.
- If Yes, continue to next screen.

Short Circuit Current Contribution Screen:

The Short Circuit Current Contribution Screen consists of two criteria; both of which must be met when applicable:

- (1) At primary side (high side) of the Dedicated Distribution Transformer, the sum of the Short Circuit Contribution Ratios (SCCR) of all Generating Facilities on the Distribution System circuit may not exceed 0.1.
- (2) At secondary (low side) of a shared distribution transformer, the short circuit contribution of the proposed Generating Facility must be less than or equal to 2.5% of the interrupting rating of the Producer's Service Equipment.

Significance:

No significant Generating Facility impact on:

- (1) Distribution System's short circuit duty
- (2) Distribution System fault detection sensitivity
- (3) Distribution System relay coordination
- (4) Distribution System fuse-saving schemes

If the Generating Facility passes this screen it can be expected that it will have no significant impact on EC's Distribution System's short circuit duty, fault detection sensitivity, relay coordination or fuse-saving schemes.

h. Screen 8: Is the Line Configuration screen met?

- If No, then the Generating Facility does not qualify for Simplified Interconnection. Perform supplemental review.
- If Yes, the Generating Facility qualifies for Simplified Interconnection.

Line Configuration Screen:

Identify primary distribution line configuration that will serve the proposed Generating Facility. Based on the type of Interconnection to be used for the Generating Facility, determine from the following table if the proposed Generating Facility passes the screen.

Primary Distribution Line Type	Type of Interconnection to Primary Distribution Line	Result/Criteria
Three-phase, three wire	Any	Pass screen
Three-phase, four wire	Single-phase, line-to-neutral	Pass screen
Three-phase, four wire (For any line that has such a section OR mixed 3 wire & 4 wire)	All others	To pass, aggregate Generating Facility Capacity must be less than or equal to 10% of Line Section Peak Load.

Significance:

If the primary distribution circuit serving the Generating Facility is of a three-wire type, or if the Generating Facility's Interconnection transformer is single-phase and connected in a line-to-neutral configuration, then there is no concern about overvoltages to the Electrical Corporation's, or other Customer's equipment caused by loss of system neutral grounding during the operating time of anti-islanding protection.

(End of Section I)

J. Testing and Certification Criteria

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1. Introduction

This Section describes the test procedures and requirements for equipment used for the Interconnection of Distributed Generation to Electrical Corporation's Distribution System. Included are Type Testing, Production Testing, Commissioning Testing, and Periodic Testing. The procedures listed rely heavily on those described in applicable Underwriters Laboratory (UL), Institute of Electrical and Electronic Engineers (IEEE), and International Electrotechnical Commission (IEC) documents—most notably UL 1741 and IEEE 929—as well as the testing described in the New York State Public Service Commission's Interconnection requirements¹. These procedures and requirements were developed prior to the completion of IEEE P1547 *Standard for Distributed Resources Interconnected with Electric Power Systems*, and should be revisited once that standard is published.

The tests described here, together with the technical requirements in Section D of this Rule, are intended to provide assurance that the Generating Facility's equipment will not adversely affect EC's Distribution System and that a Generating Facility will cease providing power to EC's Distribution System under abnormal conditions. The tests were developed assuming a low level of DG penetration. At high levels of DG penetration, other requirements and corresponding test procedures may need to be defined.

This test specification also provides a means of certifying equipment. Once a Generating Unit or device has been Certified per this Certification Process, it may be considered to be suitable for use as part of a Generating Facility interconnected with PG&E's Distribution System. Subject to the exceptions described in this Section, Electrical Corporation will not require a Producer to repeat the design review or test the Protective Functions of equipment that has been Certified. It should be noted the Certification process is intended to facilitate Generating Facility interconnections. Certification is not a prerequisite to interconnect a Generating Facility. The use of non-certified equipment may be acceptable subject to testing and approval by the EC as discussed below.

2. Certification Criteria

Equipment tested and approved (e.g. listed) by a NRTL as having met both the Type Testing and Production Testing requirements is considered to be Certified Equipment for purposes of Interconnection with EC's Distribution System. Certification may apply to either a pre-packaged system or an assembly of components that address the necessary functions. Type Testing may be

¹ "New York State Standardized Interconnection Requirements, Application Process, Contract & Application Forms For New Distributed Generators, 300 Kilovolt - Amperes or Less, Connected In Parallel with Radial Distribution Lines", November 9, 2000.

done in the factory/test lab or in the field. At the discretion of the testing laboratory, field-certification may apply only to the particular installation tested. In such cases, some or all of the tests may need to be repeated at other installations.

The use of Certified Equipment is not a requirement for interconnection. However, the use of Certified Equipment will simplify the interconnection approval process by reducing Commissioning and additional test requirements. For non-certified equipment, some or all of the tests described in this document may be required by the EC for each Generating Facility. The manufacturer or a laboratory acceptable to the EC may perform these tests. Test results for non-certified equipment must be submitted to the EC as part of the application process for EC's review and approval under the supplemental review. Approval by EC for equipment used in a particular application does not guarantee EC approval for use in other applications or by other California ECs.

When equipment is Certified by a NRTL, the NRTL shall provide to the manufacturer, at a minimum, a Certificate with the following information for each device:

a. Administrative:

- (1) Effective date of certification or applicable serial number (range or first in series), other proof that certification is current
- (2) Equipment model number (s)
- (3) Software version, if applicable
- (4) Test procedures specified (including date or revision number)
- (5) Laboratory accreditation (by whom and to what standard)

b. Technical (As appropriate):

- (1) Device rating (kW, kVA, V, A, etc.)
- (2) Maximum available fault current, A
- (3) In-rush current, A
- (4) Trip points, if factory set (trip value and timing)
- (5) Trip point and timing ranges for adjustable settings
- (6) Nominal power factor or range if adjustable
- (7) If the device/system is certified for non-export and the method used (reverse power or under power)
- (8) If the device/system is certified non-islanding

It is the responsibility of the equipment manufacturer to ensure that certification information is made publicly available by the manufacturer, the testing laboratory, or by a third party. A sample certification information form is provided in Appendix K.

3. Type Testing

Type testing provides a basis for determining that equipment is designed appropriately and meets the specifications for being designated as Certified Equipment under this Rule. The requirements described in this section cover only issues related to Interconnection and are not intended to address device safety or other issues outside the needs of the relationship between the Electrical Corporation and the Producer operating a Generating Facility.

The following table defines the test requirements by technology. Test References that are preceded by “UL 1741” refer to the section numbers of the document that describe the test requirements.² While UL 1741 was written specifically for photovoltaic inverters, the requirements are readily adapted to inverter-based Generating Facilities, synchronous machines, induction machines, as well as single/multi-function controllers and protection relays. Until a standardized test procedure is specified, the Electrical Corporation or NRTL shall adapt the procedures referenced in the following table as appropriate and necessary a machine’s performance and its control and protection system functions.

Type Tests and Requirements for Interconnection Equipment Certification

Type Test	Reference (1)	Inverter	Synchronous Machine	Induction Machine
Utility Interaction	UL 1741 - 39	X		
DC Isolation	UL 1741 - 40.1	X	—	—
Simulated PV Array (Input) Requirements	UL 1741 - 41.2	X	—	—
Dielectric Voltage Withstand	UL 1741 - 44	X	X	X
Power Factor	UL 1741 - 45.2.2	X	X	X
Harmonic Distortion	UL 1741 - 45.4	X	X	X
DC Injection	UL 1741 - 45.5	X	—	—
Utility Voltage and Frequency Variation	UL 1741 - 46.2	X	X	X
Reset Delay	UL 1741 - 46.2.3	X	X	X
Loss of Control Circuit	UL 1741 - 46.4	X	X	X
Short Circuit	UL 1741 - 47.3	X	X	X
Load Transfer	UL 1741 - 47.7	X	X	X
Surge Withstand	J.3.a	X	X	X
Anti Islanding	J.3.b	(2)	(2)	(2)
Non-Export	J.3.c	(3)	(3)	(3)
In-Rush Current	J.3.d	(4)	(4)	(4)
Synchronization	J.3.e	(5)	X	—

Notes: X = Required; — = Not required;

² UL 1741, *Inverters, Converters and Charge Controllers for use in Independent Power Systems*, Revised January 2001

Table Notes:

- (1) Reference refers to section number in either UL 1741 or this Rule. References within UL 1741 to “photovoltaics” or “inverter” may have to be interpreted by the testing laboratory to appropriately apply the tests to other technologies.
- (2) Required only if Non-Islanding designation is desired
- (3) Required only if Non-Export designation is desired.
- (4) Required for devices that use EC power to motor to speed
- (5) Required for all synchronous machines as well as inverters that operate as voltage sources when connected to the EC.

b. Anti-Islanding Test

Devices that are tested to and pass the Anti-Islanding test procedure described in UL 1741 Section 46.3 will be considered Non-Islanding for the purposes of these interconnection requirements. This test is required only for devices for which a certified Non-Islanding designation is desired.

c. Non-Export Test

Devices that pass the Non-Export test procedure described in Section J.7.a. will be considered Non-Exporting for the purposes of these interconnection requirements. This test is required only for devices for which a certified Non-Export designation is desired.

d. In-rush Current Test

Generation equipment that utilizes EC power to motor up to speed will be tested using the procedure defined in Section J.7.b. to determine the maximum current drawn during this startup process. The resulting in-rush current is used to estimate the starting voltage drop.

a. Surge Withstand Capability Test

Interconnection equipment shall be tested for surge withstand capability (SWC), both oscillatory and fast transient, in accordance with the test procedure defined in IEEE/ANSI C62.45 using the peak values defined in IEEE/ANSI C62.41 Tables 1 and 2 for location category B3. An acceptable result occurs even if the device is damaged by the surge, but is unable to operate or energize EC’s Distribution System. If the device remains operable after being subject to the surge conditions, previous type tests related to EC protection and power quality will need to be repeated to ensure the unit will still pass those tests following the surge test.

e. Synchronization Test

This test verifies that the unit synchronizes within the specified voltage/frequency/phase angle requirements. It is applied to synchronous generators and inverters capable of operating as voltage-source while connected to the EC. This test is not necessary for induction generators or current-source inverters.

The test will start with only one of the three parameters--voltage difference between Generating Facility and EC Distribution System, frequency difference, or phase angle--outside of the synchronization specification. Initiate the synchronization routine and verify that the Generating Facility is brought within specification prior to synchronization. Repeat the test five times for each of the three parameters.

For manual synchronization with synch check or manual control with auto synchronization, the test must verify that paralleling does not occur until the parameters are brought within specifications.

4. Production Testing

As a minimum, the Utility Voltage and Frequency Variation Test procedure described in UL1741 under Manufacturing and Production Tests, Section 68 shall be performed as part of routine production (100 percent) on all equipment used to interconnect DG Generating Facilities to EC's Distribution System. This testing may be performed in the factory or as part of a Commissioning Test (Section J.5).

5. Commissioning Testing

Commissioning Testing, where required, will be performed on-site to verify protective settings and functionality. Upon initial Parallel Operation of a Generating Facility, or any time interface hardware or software is changed that may affect the functions listed below, a Commissioning Test must be performed. An individual qualified in testing protective equipment (professional engineer, factory-certified technician, or licensed electrician with experience in testing protective equipment) must perform commissioning testing in accordance with the manufacturer's recommended test procedure to prove the settings and requirements of this Rule.

The EC has the right to witness Commissioning Tests as described below, or to require written certification by the installer describing which tests were performed and their results.

Functions to be tested during commissioning, particularly with respect to non-certified equipment, may consist of the following:

- a. Over- and under-voltage
- b. Over- and under-frequency

- c. Anti-Islanding (if applicable)
- d. Non-Export (if applicable)
- e. Inability to energize dead line
- f. Time delay restart after utility source is stable
- g. Utility system fault detection (if used)
- h. Synchronizing controls (if applicable)
- i. Other interconnection protective functions that may be required as part of the Interconnection Agreement

Other checks and tests that may need to be performed include:

- a. Verifying final protective settings
- b. Trip test
- c. In-service test

a. Certified Equipment

Generating Facilities qualifying for Simplified Interconnection incorporate Certified Equipment that have, at a minimum, passed the Type Tests and Production Tests described in this document, are judged to have little or no potential impact on EC's Distribution System. For such Generating Facilities, it is necessary to perform only the following tests:

1. Protection settings that have been changed after factory testing will require field verification. Tests will be performed using injected secondary voltages and currents, applied waveforms, a test connection using a generator to simulate abnormal utility voltage or frequency, or varying the set points to show that the device trips at the measured (actual) utility voltage or frequency.
2. Non-Islanding function, if included, will be checked by opening a load break disconnect switch to verify the interconnection equipment ceases to energize the line and does not re-energize for the required time delay after the switch is closed.
3. Non-Export function, if included, will be checked using secondary injection techniques. This function may also be tested by adjusting the DG output and local loads to verify that the applicable non-export criteria (i.e., reverse power or under power) are met.

The supplemental review or an Interconnection Study may impose additional components or additional testing.

b. Non-Certified Equipment

Non-certified equipment shall be subjected to the appropriate tests described in Type Testing (Section J.3.) as well as those described in Certified Equipment Commissioning

Test (Section J.5.a.). With EC approval, these tests may be performed in the factory, in the field as part of commissioning, or a combination of both. The EC, at its discretion, may also approve a reduced set of tests for a particular application or, for example, if it determines it has sufficient experience with the equipment.

c. Verification of Settings

If the testing is part of the commissioning process, then, at the completion of such testing, the EP shall confirm all devices are set to EC-approved settings. This step shall be documented in the Commissioning Test Certification.

d. Trip test

Interconnection protective devices (e.g. reverse power relay) that have not previously been tested as part of the interconnection system with their associated interrupting devices (e.g. contactor or circuit breaker) shall be trip tested during commissioning. The trip test shall be adequate to prove that the associated interrupting devices open when the protective devices operate.

Interlocking circuits between protective devices or between interrupting devices shall be similarly tested unless they are part of a system that has been tested and approved during manufacture.

e. In-service test

Interconnection protective devices that have not previously been tested as part of the interconnection system with their associated instrument transformers or that are wired in the field shall be given an in-service test during commissioning. This test will verify proper wiring, polarity, CT/PT ratios, and proper operation of the measuring circuits. The in-service test shall be made with the power system energized and carrying a known level of current. A measurement shall be made of the magnitude and phase angle of each ac voltage and current connected to the protective device and the results compared to expected values.

For protective devices with built-in metering functions that indicate current and voltage magnitudes and phase angles, or magnitudes of current, voltage, and real and reactive power, the metered values may be used for in-service testing. Otherwise, portable ammeters, voltmeters, and phase-angle meters shall be used.

6. Periodic Testing

Periodic Testing of Interconnection-related Protective Functions shall be performed as specified by the manufacturer, or at least every four years. All periodic tests prescribed by the manufacturer shall be performed. The EP shall maintain periodic test reports or a log for

inspection by the Electrical Corporation. Periodic Testing conforming to EC test intervals for the particular line section may be specified by the EC under special circumstances, such as high fire hazard areas.

A system that depends upon a battery for trip power shall be checked and logged once per month for proper voltage. Once every four years, the battery must be either replaced or a discharge test performed.

7. Detailed Type Test Procedures and Requirements

This section describes the additional Type Test procedures necessary to qualify a device as Certified, for use EC Distribution Systems. These Type Tests are not contained in Underwriters Laboratories UL 1741 Standard *Inverters, Converters and Controllers for Use in Independent Power Systems*, or other referenced standards.

a. Non-Export Test Procedure

The non-export test is intended to verify the operation of relays, controllers and inverters designed to limit the export of power and certify the equipment as meeting the requirements of Screen 2, Options 1 and 2, of the Initial Review Process. Tests are provided for discrete relay packages and for controllers and inverters that include the intended function.

[Werner Blumer, CPUC, 05142001: C1.a: The references here to “Steps” in the Initial Review Process Flow Chart makes it necessary for the utility ALs to show the Step # in addition to their paragraph numbers in the Initial Review Process Details section.]

(1) Reverse Power Relay Test

This version of the Non-Export test procedure is intended for stand-alone reverse power and under power relay packages provided to meet the requirements of Options 1 and 2 of the Non-Export Screen. It should be understood that in the reverse power application, the relay will provide a trip output with power in the export (toward the EC system) direction.

Step 1: Power Flow Test at Minimum, Midpoint and Maximum Pickup Level Settings

Determine the appropriate secondary pickup current for the desired export power flow of 0.5 secondary watts (the agreed-upon minimum pickup setting assumes 5Amp and 120V CT/PT secondary). Apply nominal voltage with minimum current setting at 0 degrees in the trip direction. Increase the current to pickup level. Observe the relay's (LCD or computer display) indication of power values. Note the indicated power level at which the relay trips. The power indication

should be within 2 percent of the expected power. For relays with adjustable settings, repeat this test at the midpoint, and maximum settings.

Repeat at phase angles of 90, 180 and 270 degrees and verify that the relay does NOT operate (measured watts will be zero or negative).

Step 2: Leading Power Factor Test

Apply rated voltage with a minimum pickup current setting (calculated value for system application) and apply a leading power factor load current in the non-trip direction (current lagging voltage by 135 degrees). Increase the current to relay rated current and verify that the relay does NOT operate. For relay's with adjustable settings, this test should be repeated at the minimum, midpoint, and maximum settings.

Step 3: Minimum Power Factor Test

At nominal voltage and with the minimum pickup (or ranges) determined in Step 1, adjust the current phase angle to 84 or 276 degrees. Increase the current level to pickup (about 10 times higher than at 0 degrees) and verify that the relay operates. Repeat for angles 90, 180 and 270 degrees and verify that the relay does NOT operate.

Step 4: Negative Sequence Voltage Test

Using the pickup settings determined in Step 1, apply rated relay voltage and current at 180 degrees from tripping direction, to simulate normal load conditions (for 3-phase relays, use I_a at 180, I_b at 60 and I_c at 300 degrees). Remove Phase-1 voltage and observe that the relay does not operate. Repeat for phase-2 and 3.

Step 5: Load Current Test

Using the pickup settings determined in Step 1, apply rated voltage and current at 180 degrees from the tripping direction, to simulate normal load conditions (use I_a at 180, I_b at 300 and I_c at 60 degrees). Observe that the relay does NOT operate.

Step 6: Unbalanced Fault Test

Using the pickup settings determined in Step 1, apply rated voltage and 2 times rated current, to simulate an unbalanced fault in the non-trip direction (use V_a at 0 degrees, V_b and V_c at 180 degrees, I_a at 180 degrees, I_b at 0 degrees, and I_c at 180 degrees). Observe that the relay, especially single phase, does not misoperate.

Step 7: Time Delay Settings Test

Apply Step 1 settings and set time delay to minimum setting. Adjust the current source to the appropriate level to determine operating time, and compare against calculated values. Verify that the timer stops when the relay trips. Repeat at midpoint and maximum delay settings

Step 8: Dielectric Test

Perform the test described in IEC 414 using 2 kV RMS for 1 minute.

Step 9: Surge withstand

Perform the surge withstand test described in IEEE C37.90.1.1989 or the surge withstand test described in Section J.3.g.

(2) Under Power Relay Test

In the underpower application, the relay will provide a trip output when import power (toward the EP) drops below the specified power level.

Note: For an underpower relay, pickup is defined as the highest power level at which the relay indicates that the power is *less* than the set setting.

Step 1: Power Flow Test at Minimum, Midpoint and Maximum Pickup Level Settings

Determine the appropriate secondary pickup current for the desired power flow pickup level of 5% of peak load (the agreed-upon minimum pickup setting). Apply rated voltage and current setting at 0 degrees in the direction of normal load current. Decrease the current to pickup level. Observe the relay's (LCD or computer display) indication of power values. Note the indicated power level at which the relay trips. The power indication should be within 2 percent of the expected power. For relays with adjustable settings, repeat the test at the midpoint, and maximum settings.

Repeat at phase angles of 90, 180 and 270 degrees and verify that the relay operates (measured watts will be zero or negative).

Step 2: Leading Power Factor Test

Using the pickup current setting determined in step 1, apply rated voltage and rated leading power factor load current in the normal load direction (current leading voltage by 45 degrees). Decrease the current to 145% of the pickup level determined in Step 1 and verify that the relay does NOT operate. For relays with adjustable settings, repeat the test at the minimum, midpoint, and maximum settings.

Step 3: Minimum Power Factor Test

At nominal voltage and with the minimum pickup (or ranges) determined in Step 1, adjust the current phase angle to 84 or 276 degrees. Decrease the current level to pickup (about 10% of the value at 0 degrees) and verify that the relay operates. Repeat for angles 90, 180 and 270 degrees and verify that the relay operates for any current less than rated current.

Step 4: Negative Sequence Voltage Test

Using the pickup settings determined in Step 1, apply rated relay voltage and 25% of rated current in the normal load direction, to simulate light load conditions. Remove Phase-A voltage and observe that the relay does not operate, repeat for phase-B and C.

Step 5: Unbalanced Fault Test

Using the pickup settings determined in Step 1, apply rated voltage and 2 times rated current, to simulate an unbalanced fault in the normal load direction (use V_a at 0 degrees, V_b and V_c at 180 degrees, I_a at 0 degrees, I_b at 180 degrees, and I_c at 0 degrees). Observe that the relay, especially single phase, operates properly.

Step 6: Time Delay Settings Test

Apply Step 1 settings and set time delay to minimum setting. Adjust the current source to the appropriate level to determine operating time, and compare against calculated values. Verify that the timer stops when the relay trips. Repeat at midpoint and maximum delay settings.

Step 7: Dielectric Test

Perform the test described in IEC 414 using 2 kV RMS for 1 minute.

Step 8: Surge withstand

Perform the surge withstand test described in IEEE C37.90.1.1989 or the surge withstand test described in Section J.3.g .

(3) Functional Test for Inverters and Controllers

Inverters and controllers designed to provide reverse or under power functions shall be tested to certify the intended operation of this function. Two methods are provided.

Method 1: If the controller utilizes external current/voltage measurement to determine the reverse or underpower condition, then the controller shall be functionally tested by application of appropriate secondary currents and potentials as described in the Reverse Power Relay Test, [Section J.7.a.\(1\) of this Rule](#).

Method 2: If external secondary current or potential signals are not used, then unit-specific tests must be conducted to verify that power cannot be exported across the PCC for a period exceeding two seconds. These tests may be factory tests, if the measurement and control points are part of a single unit, or may be provided for in the field.

b. In-rush Current Test

This test will determine the maximum in-rush current drawn by the unit.

(1) Locked-Rotor Method

Use the test procedure defined in NEMA MG-1 (manufacturer's data is acceptable if available).

(2) Start-up Method

Install and setup the DG equipment as specified by the manufacturer. Using a calibrated oscilloscope or data acquisition equipment with appropriate speed and accuracy, measure the current draw at the Point of Interconnection as the DG starts up and parallels with EC's Distribution System. Startup shall follow the normal, manufacturer-specified procedure.

Sufficient time and current resolution and accuracy shall be used to capture the maximum current draw within five percent. In-rush current is defined as the maximum current draw from the EC's Distribution System during the startup process, using a 10-cycle moving average. During the test, the utility source, real or simulated, must be capable of maintaining voltage within +/- five percent of rated at the connection to the unit under test. Repeat this test five times. Report the highest 10-cycle current as the in-rush current

A graphical representation of the time-current characteristic along with the certified in-rush current must be included in the test report and made available to the EC.

(END OF ATTACHMENT A)

Appendix K

Utility Interconnection Equipment Certification Form

Utility Interconnection Equipment Certification

The information on this form is provided to indicate the compliance of the generation equipment listed below with the utility interconnection certification requirements defined in California PUC Electric Rule 21

Certifying Laboratory *The information on this form is provided by the following Nationally Recognized Test Laboratory:*

Laboratory: _____

Contact Name: _____ Phone: _____ E-mail: _____

Address: _____

City: _____ State: _____ Zip: _____

Accredited by: _____ Date: _____

Accredited to (test standards)¹: _____

Equipment Specification *The information on this form applies to the following equipment:*

Equipment Manufacturer: _____

Address: _____

City: _____ State: _____ Zip: _____

Model Number(s): _____

Software Version(s): _____

Effective²: _____

Device Description³: _____

Test Results⁴

Mark the box next to each requirement that has been met and each test that has been performed and successfully passed. Provide a explanation of any exceptions or omissions on a separate sheet. List additional test documents used on a separate sheet.

UL 1741: (Section number listed)

☐-39 ☐-40.1 ☐-41.2 ☐-44 ☐-45.2.2 ☐-45.4 ☐-45.5
☐-46.2 ☐-46.2.3 ☐-46.4 ☐-47.3 ☐-47.7 *Optional:* ☐-46.3

☐-IEEE/ANSI C62.45/C62.41 (location Category B3)

California Rule 21: ☐-J.3.e Non-export ☐-J.3.f In-Rush Current ☐-J.3.h Synchronization

Device Rating:⁵ _____

Maximum available fault current, A _____

In-rush current⁶, A _____

Trip settings⁷:

		Setting 1	Setting 2	Setting 3	Setting 4	Setting 5	Factory Settings ⁸
Fast Over Voltage	Setting	/	/	/	/	/	/
	Measured	/	/	/	/	/	
Fast Over Voltage	Setting	/	/	/	/	/	/
	Measured	/	/	/	/	/	
Fast Over Voltage	Setting	/	/	/	/	/	/
	Measured	/	/	/	/	/	
Fast Over Voltage	Setting	/	/	/	/	/	/
	Measured	/	/	/	/	/	
Fast Over Voltage	Setting	/	/	/	/	/	/
	Measured	/	/	/	/	/	
Fast Over Voltage	Setting	/	/	/	/	/	/
	Measured	/	/	/	/	/	

Nominal Power Factor (Range, if adjustable) _____

Non Islanding: Yes ____ No ____ Maximum trip time: _____

Non Export: Yes ____ No ____ Method: _____

Other⁹: _____

NOTES

- ¹ Accreditation must apply to test standards listed herein
- ² Note here the date of certification, applicable serial number (range or first in series), or other information that indicates which units the certification applies to.
- ³ List appropriate functions, capabilities, applications, limitations, etc. Use additional sheets as necessary.
- ⁴ List all test documents (i.e. UL 1741, IEEE C62.45)and specific procedures (i.e. .UL 1741 Sec 39.1 – 39.5, etc.) used to evaluate device's suitability for utility interconnection
- ⁵ kW, kVA, V, A, etc as appropriate
- ⁶ For devices that use grid power to motor to speed
- ⁷ Trip value (Voltage in volts or frequency in Hz) and timing (in cycles). Devices with adjustable settings shall provide test results over the range of settings. For each test setting provide the setting values in the upper box and measured results in the lower box . List device ranges, if adjustable.
- ⁸ Note standard factory settings. Proved Voltage/Timing or Frequency/Timing
- ⁹ Provide any additional information that may be useful in evaluating these results such as test configurations, device settings used to meet requirements, etc. Use additional sheets if necessary